



AGRICULTURAL RESEARCH INSTITUTE
PUSA

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

VOLUME XXXIX

JULY-DECEMBER, 1918



WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

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As the war goes on, there are many indications that one of its results will be to demonstrate anew the value of generous and systematic provision for the encouragement of agricultural research. The urgent demand for information for immediate application has revealed as the essential prerequisite the possession of a substantial fund of scientific knowledge. It has made it clear that the accumulation of such a body of knowledge is not a matter to be improvised in an emergency but something to be attained gradually by carefully planned investigation. The situation has directed attention to what has already been accomplished by research institutions fostered by public funds, and has stimulated inquiry and discussion as to means for so strengthening such institutions as to bring about their maximum efficiency.

Reference has recently been made in these columns to the unusual interest which is being manifested along these lines in England and even more largely in France, where elaborate plans are already under consideration for the reorganization of the whole system of agricultural research, instruction, and extension activities. Concern in the matter is, however, by no means confined to Europe, but may be said to be virtually world-wide in scope.

One of the countries in which definite plans are being formulated to develop agricultural research more effectively is Australia. Although that Commonwealth is geographically far removed from the boundaries of the United States, many of the conditions there prevailing have for us special interest. Both countries are still relatively new agricultural regions and embrace approximately equal land areas. Both contain within their borders a wide and somewhat comparable range of climatic conditions, including large tracts with insufficient rainfall. In each case agriculture and animal husbandry rank among the most important industries. There are also certain points of resemblance as to constitution and government, notably as to the division of powers between the Federal authority and the several States, which necessarily influence the development of Federal and State institutions.

Agricultural research in Australia has been in progress on an organized basis since approximately the date of passage of the Hatch Act in this country. There has been, however, no provision for a Federal system of either agricultural education or research, nor is there any institution corresponding to our own Federal Department of Agriculture. This is less surprising when it is recalled that the Australian Commonwealth was not organized until 1901, and that during the previous decade strong State departments of agriculture had become established.

Research activities have thus far been centered almost entirely in these State departments of agriculture. They exercise administrative control over the agricultural colleges in their territory, in connection with which experimental farms have been carried on for many years. They also conduct farms and laboratories of their own for general experimental work, as well as farms devoted to viticulture, irrigation, sugar cane, stock feeding, utilization of prickly pear, dairying, and similar specialized branches. They operate many demonstration farms and plats and engage quite extensively in regulatory and similar control functions. Another distinctive feature is their publication of monthly farm journals which constitute their principal means of dissemination of the results of their experimental work and other information of interest to farm periodicals, agricultural societies, farmers, and others.

Most of the experimental farms are of great size and provided with excellent equipment for large-scale field work. For instance, in New South Wales the Hawkesbury Agricultural College, which has carried on experimental work since 1892, has a farm of 3,500 acres, of which over 200 acres is in experimental plats. The Wagga State Experimental Farm comprises 3,300 acres, with several thousand varieties of fruit under test and extensive work with cereals and live stock. The Roseworthy Agricultural College and Experimental Farm in South Australia, founded in 1883, has a farm of about 1,600 acres and 100 acres in permanent experiments, and the corresponding institution at Dookie, in Victoria, opened in 1886, has a farm of about 4,500 acres, of which about 400 acres is annually devoted to experiments with cereals and fodder plants. In all, there are about 30 stations or farms devoted to experimentation, with a total farm area of nearly 50,000 acres. In addition, there are about 50 experimental orchards, vineyards, and semipermanent areas.

The most important single line of research has probably been the production of new varieties of wheat, in which much progress has been attained. This work has been conducted at a large number of stations, notably at the Cowra Station in New South Wales and the Werribee Central Research Station Farm in Victoria, and the various institutions referred to above.

Most of the laboratory work is directly attached to the State departments of agriculture at their several headquarters. A wide range of activity is under way, including studies of plant and animal diseases, insect pests, chemistry of soils and wheat, soil biology, and numerous other lines.

At the outbreak of the war a large amount of experimental work was in progress and substantial results were being obtained. At the same time a feeling had been developing that the lack of any central organization was leading to some overlapping in the investigations undertaken by the several States, and that steps should be taken to secure greater coordination of effort. This view had been expressed as early as 1911 by the Scottish Agricultural Commission, which, in response to an invitation from the Australian Government, spent several months in a survey of rural conditions and activities in Australia. In the words of this commission, "it appeared to us that a considerable amount of overlapping was going on; that, in general, there was a want of coordination and cooperation; that the policy of allowing each State to attempt to attack the solution of each agricultural problem by itself was not the most economical. There are many problems which are common to the whole of Australia, or to the greater part of it, and it would appear that time and money would be saved by placing some of the work of research in the hands of a Federal department." The difficulty was regarded as most serious in the study of animal diseases, the control of prickly pear, and similar large-scale undertakings.

In 1916, apparently as a war measure, the Governor General of Australia appointed what is termed an "advisory council of science and industry" for the purpose of furnishing advice to the Government on questions relative to scientific research. An appropriation of \$25,000 was subsequently made available for its use. This council has functioned chiefly through an executive committee, of which the prime minister of the Commonwealth has been chairman and Prof. D. Orme Masson, of the University of Melbourne, deputy chairman. Several others prominent in agricultural science are members of the committee, and a large share of its attention has been given to problems connected with agricultural research.

The committee has collected information regarding the present status of experimental work in agriculture and the relations of the various agencies through which it is being conducted. Its acting secretary accompanied the prime minister in a visit of inquiry to North America and Great Britain, and subsequently published an interesting monograph on the organization of scientific research institutions in the United States. What is termed a "science abstractor" was also appointed to summarize available data, prepare

bibliographies, and institute a Commonwealth catalogue of scientific periodicals. A register of research work in scientific and technical laboratories has already been prepared, and it is planned to supplement this with a similar register of the experimental work at the various Government farms.

A number of special committees were also organized, with small grants of funds. Some of the committees have carried on actual experimental work, taking up such projects as the methods of extraction of potash and aluminum from alunite, the tanning properties of certain Australian woods, the electrical sterilization of milk, and the means of transmission of the worm nodule parasite in cattle. Other committees were formed to review existing information and report as to the best lines of future investigation of such problems as tick control, combating of nodule disease in cattle, and the diminution of losses to stored products by insect pests. Most of these questions were found to be too large and complex for handling through a temporary organization or to necessitate action by the Federal Government in cooperation with the State authorities. A similar view was taken as to several other projects inquired into by the executive committee itself, such as the institution of a soil survey, the eradication of the prickly pear, and the encouragement of cotton and flax production.

The principal recommendation of the advisory council has been for the immediate creation of a Commonwealth institute of science and industry. Under the plan proposed, this institute would be established by act of Parliament as a permanent institution. It would be organized purely for research activities and carefully dissociated from all routine control work.

Among the functions suggested for the institute are the initiation of scientific researches in connection with the primary industries of the Commonwealth, the collection of industrial scientific information, and the establishment and maintenance of special national laboratories. The coordination and direction of scientific work in the various existing institutions, with a view to the prevention of undesirable overlapping of effort, is specifically proposed. The stimulation of scientific research through grants to institutions, co-operation with scientific societies, and assistance to educational authorities in advancing scientific teaching and the training of investigators are also suggested.

The "primary industries" referred to, of course, include crop raising and animal husbandry, and it is evident that large attention would be given to their problems. A definite program is set forth for the initial years of operation which includes studies in plant genetics, plant pathology and insect pests, soil fertility and biochemistry, the breeding and feeding of live stock and the improve-

ment of dairy products, the control and eradication of animal diseases, economic biology, plant utilization, the extension of cotton and flax growing, forestry, and the development of improved machinery. The establishment of special national laboratories is suggested for research in dry farming, control of animal pests and diseases, and utilization of forest products.

The administration of the institute would be vested in three salaried directors, appointed by the governor general, one to be a business man with ability in organization, and the others chosen mainly for scientific attainments and experience. An advisory council representing science and the principal industries would also be selected for each State. The institute staff would be appointed by the governor general, upon recommendation of the directors.

The general features of the organization and lines of work of this somewhat novel institute have been approved provisionally by the Commonwealth Government, but at the time of writing no notice of the formal adoption of the project has been received. The advisory council has been earnestly urging immediate action, as it has felt that its temporary organization was inadequate for the purpose in view. Moreover, several of the States have been anxious to undertake various scientific investigations which it was believed should be under the direction of a Commonwealth institution, and it was thought that the early commencement of the enterprise, in which great stress is laid upon the principle of cooperation between the institute and the States, would prove of much advantage.

Further evidence of Australian interest in agricultural research is afforded by an account just received of the proceedings of a week's conference on that subject, held at Melbourne in November, 1917. This conference was called by the executive committee of the advisory council and was attended by representatives of the council, the State departments of agriculture, the various agricultural colleges and universities, and others interested in agricultural science. Inasmuch as there exists in Australia no organization comparable to the Association of American Agricultural Colleges and Experiment Stations, the assembling of this conference was in itself a matter of some significance.

The conference program consisted largely of the presentation of scientific papers similar in scope to those usually offered in the agriculture section of the Australian Association for the Advancement of Science, but having special reference to the status of research under the war conditions. Several of the papers dealt with problems connected with cereal improvement, the acclimatization of plants, and studies of the native grasses and fodder plants, while others took up the tobacco, sugar, and fiber-plant industries, crops for

the production of power alcohol, and the utilization of the phosphate deposits of Australia. One entire session, however, was devoted specifically to a general discussion of agricultural research, with addresses entitled, "Some suggestions as to the Commonwealth Endowment of Agricultural Research," by Prof. A. J. Perkins, director of agriculture in South Australia, and Agricultural Research and the Prevention of Overlapping, by Mr. R. D. Watt, professor of agriculture in the University of Sydney. These addresses were followed by an extended discussion.

The paper offered by Prof. Perkins advocated especially the development of research in the universities. These institutions, unlike the agricultural colleges, are not connected with the State departments of agriculture, and for various reasons apparently have not thus far been able to give much attention to agricultural research. Prof. Perkins's plan contemplates the location of permanent agricultural research stations at these institutions, financed, if necessary, by Commonwealth appropriations. He announced that at one university, that at Adelaide, land has already been made available for the purpose and plans are under way for the commencement of operations by means of private contributions. He also favored the granting of financial assistance for approved experimental work by private individuals.

The address of Prof. Watt likewise directed attention to the opportunities for developing research in agriculture at the universities, though he pointed out that the number of university students in agriculture is at present too small to warrant a sufficiently large staff for extensive development. He suggested the propriety of the private endowment of research scholarships and fellowships.

The shortage of adequately trained research workers was referred to by several speakers as one of the principal obstacles in the way of extension of activities at the present time. The Australian agricultural colleges, while well attended, are designed primarily to turn out practical farmers, and, although five universities have been offering courses in agriculture for about 10 years, enrollment has always been small, and in recent years has been diminishing. This condition is attributed in part to the restricted field now open to the university graduates in agriculture. A resolution was adopted by the conference, requesting the advisory council to bring the need of training more research workers to the attention of the universities. In this connection it is of interest to note that the University of Melbourne has itself been making special inquiries along this line, and a committee has submitted a new degree course as a foundation training for prospective teachers and investigators.

The question of the establishment of the proposed permanent institute of science and industry was not directly presented to the

conference nor was definite action taken concerning it. Reference to it, however, was made in various papers, and it is evident that the project has received much consideration. Some apprehension was expressed against any procedure which might unduly centralize or "officialize" research, while other speakers regarded the project as likely to prove extremely beneficial in several directions. Prof. H. A. Watt suggested as quite conceivable the eventual evolution of the agricultural activities of the institute into something approximating a Federal department of agriculture. Numerous references were made to the organization of agricultural agencies in the United States, and the conference adopted a recommendation requesting the early appointment of a permanent agricultural representative from Australia to this country to keep in touch with methods of work and similar matters.

While it thus appears that there are some difficulties to be confronted in the future development of agricultural research in Australia, it is likewise evident that the outlook for increased activity is quite favorable. There seems to be general recognition of the value of research, especially under the present conditions, and a disposition to consider carefully means for its systematic encouragement. The adoption of plans and their development will doubtless be awaited with interest by all who are concerned with the promotion of agricultural research, both in Australia and beyond its borders.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Physical chemistry of vital phenomena. J. F. McCLENDON (*Princeton, N. J.: Princeton Univ. Press, 1917, pp. VIII+240, pl. 1, figs. 31*).—This book comprises a course of lectures and laboratory work given to graduate and advanced medical students in the University of Minnesota. "The purpose of the book is not to go far into physical chemistry but to develop a tool for physiological research." A discussion of the general principles of physical chemistry is followed by chapters on enzym action; permeability of cells; negative osmose and the polarization of membranes in relation to the bioelectric phenomena, stimulation, absorption, and secretion; anesthesia and narcosis; cytolysis and disinfection; ameboid motion and tropisms, cell division, fertilization, and parthenogenesis; muscular contraction, oxidation, and heat and light production; and blood and other cell media. An extensive literature list is appended.

Chemistry in the service of man, A. FINDLAY (*London: Longmans, Green & Co., 1917, 2. ed., pp. XVI+272, pls. 3, figs. 23*).—The basis of this book is a series of lectures delivered in 1915 the aim of which was to present in a non-technical form "some account of what the science of chemistry, both in its general principles and in its industrial applications, has accomplished for the material well-being and uplifting of mankind." In this, the second edition, the book remains essentially unchanged, but a new chapter on fermentation and enzym action has been added.

Technical handbook of oils, fats, and waxes.—I, Chemical and general, P. J. FRYER and F. E. WESTON (*Cambridge, Eng.: University Press, 1917, vol. 1, pp. [X]+279, pls. 42, figs. 33; rev. in Jour. Soc. Chem. Indus., 37 (1918), No. 1, p. 23 R; Analyst, 43 (1918), No. 503, pp. 75, 76*).—This book was designed primarily to furnish a survey of the main facts relating to the chemistry and technology of oils, fats, and waxes of animal, vegetable, and mineral origin to meet the need of the technical worker, the works chemist, and students. It contains sections on the chemistry, testing and analysis, classification, and production and refinement of oils, fats, and waxes, and one on oleoresins and essential oils. A special feature is the colored diagrams of the more important analytical determinations showing the limit of extreme variations and the average value for each substance.

It is stated that a companion volume on the methods used in the analysis of oils, fats, and waxes is in course of preparation.

The oils in cherry pits, H. L. MAXWELL (*Chem. News, 117 (1918), No. 3042, pp. 122-124, fig. 1*).—Crushed dried cherry kernels were extracted with ether and the resulting oil examined for its physical and chemical properties. The kernels gave a yield of 37.6 per cent of a mixture of oils of the characteristic odor of almond oil. About 10 per cent of the oil solidified at a temperature of -5° C., the rest remaining liquid to about -20° . The larger fraction was found to have a specific gravity of from 0.922 to 0.925 and a saponification number of 276.8. These results and other characteristic tests show that the oil is essentially the same as almond oil.

An extraction apparatus is described consisting of two flasks connected by means of two siphon tubes, one extending to the bottom and the other just below the cork in each flask. The flask in which the material to be extracted is placed is also connected with a reflex condenser. Both flasks are half filled with the solvent and the longer siphon tube is also filled. The flasks are then heated on water baths. The vaporized ether from the second flask passes through the short siphon and is condensed in the reflux condenser. This increases the volume of ether in the first flask, thus starting the siphon which carries the ether and the dissolved oil back into the second flask. The operation is continued as long as necessary. The apparatus can be used with various solvents and on different substances and is said to be very accurate and economical in time and solvent.

The oils of gourd seed (squash and pumpkin), A. TRUELLE (*Vie Agr. et Ruralc*, 8 (1918), No. 12, pp. 204-206, figs. 3).—The composition of the seeds of various members of the gourd family is given, together with the yield and properties of the oil and oil cake derived from them. The author suggests the utilization of such oils where possible for the table and otherwise for lighting and lubricating purposes.

The peanut (*Inst. Colon. Marseille, Bul. Sect. Mat. Grasses*, No. 4 (1918), pp. 48).—This publication contains descriptions of the various types of machines for shelling peanuts, and a French translation of Farmers' Bulletin 751 on peanut oil (E. S. R., 35, p. 806). Statistics are also given of the production and exportation from various countries of the oil of the coconut, soy bean, olive, whale, and flax plant. Tables are included showing the importation of fruits, seeds, and oils into Marseille in 1916 and importations and exportations in England for the years 1915, 1916, and 1917.

The loganberry and the acid content of its juice, M. R. DAUGHTERS (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 1, p. 30).—This continues the analysis of the loganberry previously noted (E. S. R., 38, p. 203), this paper giving the composition of the fresh whole berry and four additional analyses of the juice with special reference to its acid content.

The composition of a sample taken from 14 lbs. of fresh ripe berries was found to be as follows: Total solids, 20.74 per cent; moisture, 79.26; citric acid, (anhydrous), 1.52; invert sugar, 7.15; sucrose, absent; proteins (N×6.25), 4.55; fat (ether extract), 0.613; crude fiber, 1.38; and ash, 0.571 per cent.

The citric acid was determined by the Kunz modification of Stahre's method (E. S. R., 36, p. 415), the applicability of which to fruit juices has been proved by Dunbar and Lepper.¹

Citric is the chief acid of the loganberry. Traces of tartaric and volatile acids are present. Malic acid is absent.

Methods of pure culture study, H. J. CONN ET AL. (*Jour. Bact.*, 3 (1918), No. 2, pp. 115-128).—This is the preliminary report of the committee on the chart for identification of bacterial species and consists of methods to be put into provisional use for routine bacteriological work. Directions are given for the preparation of media, invigoration of cultures, and the study of the morphology, cultural characteristics, and physiology of bacteria. A glossary of terms is appended.

Colorimetric determination of reaction of bacteriologic mediums and other fluids, G. D. BARNETT and H. S. CHAPMAN (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 15, pp. 1062, 1063).—The authors describe a method devised to determine fairly accurately hydrogen ion concentration without the necessity of prepar-

¹ Jour. Assoc. Off. Agr. Chem., 2 (1917), No. 4, pp. 175-182.

ing standard solutions. The principle used is that of superimposing the two extreme colors of the indicator as outlined by Clark and Lubs (*E. S. R.*, 37, p. 506) in determining the so-called half-transformation points of indicators. The method as outlined covers a range of hydrogen ion concentration from pH^7 to pH^8 , using phenolsulphonaphthalein as indicator.

Autolysis of yeast and the influence of its proteolytic products on the growth of the yeast and of lactic acid microorganisms, P. VANSTEENBERGE (*Ann. Inst. Pasteur*, 31 (1917), No. 12, pp. 601-630).—In this article are discussed the conditions necessary for yeast autolysis, as reported by other investigators and determined experimentally by the author, and the nutritive value of the autolyzed yeast compared with the extract of nonautolyzed yeast.

The optimum temperature for autolysis was found to be from 48 to 50° C. Indications of successful autolysis are the increase of acidity to a certain fixed degree and the crystallization of tyrosin in the extract. Yeast extract obtained by simple boiling of fresh yeast in water contains only one-third of the total nitrogen of the yeast. Autolysis of the yeast for 23 hours at from 48 to 49° transforms all of the nitrogen into soluble products not coagulable by heat and of much better quality than in the original yeast. The extract of autolyzed yeast is more nutritive for the yeast and lactic acid organisms than that obtained by simple boiling. The nutritive value may be attributed to a mixture of proteolytic products among which peptone plays the most important part. Small quantities of a series of substances, including leucin, asparagin, and tyrosin, exert, independently of peptone, a favorable influence on yeast and on the lactic acid organisms. In a more concentrated form, these amino acids exert a harmful effect upon the growth of yeast. The value of malt extract may also be attributed to the presence of a series of proteolytic products analogous to those in autolyzed yeast.

What are enzymes? B. HOROWITZ (*Sci. Mo.*, 6 (1918), No. 3, pp. 253-259).—This is a popular historical summary of investigations on enzymes.

Organic nitrogenous compounds in peat soils.—III. The nitrogen distribution in peat from different depths, C. S. ROBINSON and E. J. MILLER (*Michigan Sta. Tech. Bul.* 35 (1917), pp. 3-29, figs. 9).—Investigations are described dealing with the application of some of the methods of protein analysis to a study of the nitrogenous compounds in peat soil, based upon previous investigations made at this station (*E. S. R.*, 25, p. 623) which, together with similar work done elsewhere, are thought to have demonstrated the protein origin of organic nitrogenous materials in soils. The present work has to do primarily with a study of the variation in nitrogen partition in peat with depth or age and state of decomposition; with a comparison of its composition with that of pure proteins; and with a determination of the possible relationship between chemical composition, as determined by the above mentioned methods of analysis, and nitrogen availability as determined by the alkaline permanganate method. Considerable analytical data are presented in tabular form, illustrated by graphs, and fully discussed, and form the basis for the following conclusions:

"There is no regularity in the variation of total nitrogen and ash contents with the depth of the deposit, the fluctuations being determined rather by the conditions of formation and the composition of the peat-forming vegetation. The amounts of the larger groups determined by the Van Slyke method do not consistently show a regular increase or decrease with depth and, where the botanical composition of the peat-forming plants was approximately constant, they showed no variations in quantity above those ascribable to experimental errors in their determination. It follows that the organic nitrogenous material

is extremely resistant to decomposition under the conditions in a peat deposit and it must be regarded as a possibility that the constitution of some of the components of some of the groups, notably those included under acid amids, differs radically from those usually attributed to these compounds. In comparison with ordinary proteins, peat contains a larger percentage of acid amid and humin nitrogen and a smaller amount of basic and nonbasic nitrogenous compounds. The available nitrogen as determined by the alkaline permanganate method did not show any regular variation with the depth of the deposit. In quantity it somewhat exceeded the acid amid nitrogen with which it seems to give slight indications of being associated. Owing, however, to the lack of any distinctive form in the curves no certain relationship could be demonstrated."

The freezing point method as a new means of studying velocity of reaction between soils and chemical agents and behavior of equilibrium, G. J. BOURGOUS and W. A. LAUDEMAN (*Michigan Sta. Tech. Bul. 37 (1917), pp. 32*).—In this investigation the freezing point method has been used to study the velocity of the reaction between soils and chemical agents, such as salts, acids, and bases, and the behavior of the equilibrium. The apparatus employed was the same as that used in investigations previously noted (*E. S. R., 38, p. 16*). The procedure consisted of mixing soils and reagents together and determining at once and at various intervals the freezing point lowering. From these depressions the velocity of reaction and behavior of equilibrium were ascertained. The results are summarized as follows:

"The velocity of the reaction between mineral soils and mineral and organic salts is extremely rapid if not almost instantaneous, and the equilibrium attained remains constant for a long time. Thus, the depression is already constant before 4 minutes have elapsed and continues to remain constant for a period of 60 days and even 100 days in some cases.

"The reaction between various soils and acid phosphate salts is also very rapid at the beginning, but the equilibrium does not remain stationary in all of the soils. Thus, the freezing point lowering is already constant before the expiration of 4 minutes and continues to remain constant for the next 20 minutes during which it is studied, and then begins to decrease in all the soils except the sand and peat.

"The behavior of the equilibrium in peat treated with the various salts is somewhat different from that of the mineral soils treated with the same salts. In the peat the depression of the acid phosphate salts remained constant while that of the nitrates and acetates decreased.

"The behavior of the reaction between the different soils and different acids is entirely different. Any one acid acts entirely differently upon the various soils and conversely, any one soil is acted upon entirely differently by the various acids. On the whole, however, the data show that the initial velocity of the reaction is very rapid and that the initial equilibrium remains constant for at least 25 minutes in all the soils. Then this equilibrium begins to change in some of the soils while it remains constant in others.

"The initial velocity of the reaction between bases is also extremely rapid and the equilibrium attained remains constant for a long time in all the bases except in the $\text{Ca}(\text{OH})_2$. In this case the equilibrium changes in some of the soils while it remains stationary in others."

An accurate loss-on-ignition method for the determination of organic matter in soils, J. B. RATHER (*Arkansas Sta. Bul. 140 (1917), pp. 3-16, figs. 4*).—The basis of the method described is the fact that the minerals in the soil which interfere with the accuracy of the loss-on-ignition method for the

determination of organic matter can be removed by successive digestions with a 1 per cent acid solution containing 0.5 per cent each of hydrochloric and hydrofluoric acids without decomposing or dissolving more than a slight amount of organic matter. The procedure is as follows:

A 1 gm. sample is digested twice with 50 cc. of water for five minutes on a boiling water bath or at 85° C. and decanted through a Gooch crucible, using suction. The extract is transferred to beakers and concentrated to a few cubic centimeters. The residue is digested six times with 10 cc. of 2.5 per cent hydrochloric acid, 10 cc. of 2.5 per cent hydrofluoric acid, and 30 cc. of water. After washing with water, the residue is transferred to a small dish and the concentrated water extract added. After drying to constant weight at 100°, the residue is ignited and the total organic matter calculated from loss on ignition. A more rapid and in most cases quite as satisfactory method omits the water extraction, disregarding the possible water-soluble organic matter in the soil since duplicate analyses have shown that, except in the case of some soils very rich in organic matter, the results in both methods are practically the same.

The investigation includes results of examination of the effect of the acid reagent on hydrated and unhydrated minerals, on the mineral matter in different kinds of soil, on the loss on ignition and on the organic carbon in the soil. A table is given of the analyses of 25 varieties of soils for organic matter by the two methods outlined above and by the older organic carbon and loss-on-ignition methods.

The author believes "that the method for the determination of organic matter outlined in this paper eliminates the errors in the loss-on-ignition method due to hydrated minerals and carbonates and probably to unoxidized minerals, and that it is superior to the organic carbon method for the determination of organic matter in soils."

The volumetric determination of sulphates in water extracts of soils, A. W. CHRISTIE and J. C. MARTIN (*Soil Sci.*, 4 (1917), No. 6, pp. 477-479).—The volumetric method for the estimation of small amounts of sulphate in the urine by titration of the precipitated benzidin sulphate with potassium permanganate, as described by Raiziss and Dubin (*E. S. R.*, 33, p. 415), has been adapted by the authors at the California Experiment Station to the determination of small amounts of water-soluble sulphates in soil. In the final titration

$\frac{N}{20}$ potassium permanganate is used, 1 cc. of which is calculated to equal 0.15 mg. SO₄. Care should be taken in the washing of the precipitate, as if less than 15 cc. of wash water is used high results are obtained, indicating that the excess reagent has not been entirely removed, while with more than 20 cc. low results are obtained, due to the slight solubility of benzidin sulphate.

The accuracy of the method has been tested with sulphate solutions of known concentration and with a typical 1:5 soil extract. The method has an average error of 3 per cent and is believed to be superior to colorimetric or nephelometric methods, especially for small amounts of sulphate.

A study of the De Roode method for the determination of potash in fertilizer materials, T. E. KEITT and H. E. SHIVER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 3, pp. 210-222; *abs. in Chem. Abs.*, 12 (1918), No. 10, pp. 1095, 1096).—The author reports results obtained at the South Carolina Experiment Station for the determination of potash in fertilizer materials by the method proposed by De Roode (*E. S. R.*, 6, p. 367) and later by Moore (*E. S. R.*, 10, p. 408). The method, which is applicable to all commercial fertilizers, including salts, is described in detail, and analyses are reported of samples of commercial fertilizers and various synthetic solutions of known composition by the modified De Roode and the official Lindo-Gladding method.

Some of the advantages of the modified De Roodé method are ease and rapidity of manipulation and a higher degree of accuracy due to the elimination of incineration, precipitation, filtration, and prolonged evaporation. By avoiding ignition, porcelain dishes may be used instead of platinum.

The precipitation of phosphoric acid as ammonium phosphomolybdate: A practical determination of phosphoric acid by a simple nitrometric measurement, J. CLARENS (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 6, pp. 259-262).—The author has proved that the precipitate obtained by the action of the molybdic reagent under the usual conditions is insoluble in distilled water.

Nitric acid, 1 part in 100, dissolves first from the precipitate a very small portion of phosphoric acid easily determined, and also a larger more important fraction not containing phosphoric acid but which is a true ammonium nitromolybdate. The remaining precipitate is a mixture of diammonium and triammonium phosphomolybdates in proportions depending on the concentration of ammonium salts in the precipitating liquids.

By increasing the proportion of ammonium salts in the precipitating liquids by addition of ammonium nitrate, nitric acid is replaced progressively by ammonium nitrate until the amount of ammonia existing in the precipitate is the same as if all the phosphoric acid had been precipitated as triammonium phosphate. The amount of ammonium nitrate to be used should be from 15 to 20 gm. of the salt for 100 cc. of the molybdic reagent. The determination of phosphoric acid becomes then a determination of ammonia, which can be brought about by any nitrometric method after dissolving the precipitate in potassium hydroxid.

Compilation of recommended methods for the physical and chemical examination of water and sewage, A. V. DELAPORTE (*Ann. Rpt. Prov. Bd. Health Ontario*, 35 (1916), pp. 147-149).—The methods outlined are those employed at the experimental station of the Provincial Board of Health of Ontario and are similar to the standard methods of water analysis of the American Public Health Association. Exceptions are the use of an alkaline methyl orange solution as a permanent standard for ammonia instead of the platinum cobalt standard and, as a permanent standard for nitrites, a solution of fuchsin to which is added a little copper sulphate solution. In estimating nitrates by the phenol sulphonic method in samples of high chlorin content, sufficient standard sodium chlorid solution is added to the standard to make the chlorin content the same as in the sample and thus render unnecessary the precipitation of chlorin in the solution.

Deterioration in asparagus, K. G. BITTING (*Nat. Cannery Assoc. Bul.* 11 (1917), pp. 18, pls. 5).—The histological changes taking place in cut asparagus under different conditions of temperature, length of standing, etc., were determined by the increase in lignification observed in transverse sections stained with safranin. Tests were also made for tannin and coniferin in view of the development of a bitter principle coincident with the toughening.

The experiments reported indicate that in order to retain the tenderness and delicate flavor of freshly cut asparagus the stalks should be canned within 24 hours after cutting. If it is necessary to hold them for a longer period they should be kept at as low a temperature as possible and the large stalks scraped deep enough to remove the zone of bast fibers which is the material agent in the toughening.

The direct or Breed method for counting bacteria in tomato catsup, pulp, or paste, CHARLOTTE VINCENT (*Jour. Bact.*, 3 (1918), No. 2, pp. 183-185).—The direct method of counting bacteria devised by Breed (*E. S. R.*, 26, p. 274) was

compared with the standard Zeiss blood counter method as described by Howard (E. S. R., 24, p. 613). The direct count was found to give much larger numbers of bacteria than the Zeiss method, the advantages being that a bacillus can always be distinguished from micrococci or inert material and that micrococci can be counted, as they are easily stained and recognized in this method.

The nature of the inosit phosphoric acids of some important feeding materials, J. B. RATHER (*Arkansas Sta. Bul.* 138 (1917), pp. 3-16; *Jour. Amer. Chem. Soc.*, 40 (1918), No. 5, pp. 523-536).—The author has continued his study of the nature of the inosit phosphoric acids in feeding materials by an examination of wheat bran, corn, Kafir corn, oats, rice bran, and rice polish. The method of preparation previously noted (E. S. R., 37, p. 502) was used in all cases and was checked in the case of wheat bran by the method of Anderson (E. S. R., 33, p. 11).

The results indicate that the principal phosphoric acid in all the materials studied is inosit pentaphosphoric acid of the composition $C_6H_6(OH)(H_2PO_4)_5$. Determined quantitatively by the author's method, previously noted (E. S. R., 38, p. 11), this acid was found to be from 75 to 95 per cent of the acid-soluble phosphorus, while the inorganic phosphorus was from 3 to 18 per cent, leaving from 0 to 13 per cent to be accounted for in other forms. While the presence of other inosit phosphoric acids is not excluded by this work, the author concludes that they can not be present in amounts much exceeding 10 per cent of the total acid-soluble phosphorus.

Note on the colloid chemistry of Fehling's sugar test, M. H. FISCHER and MARIAN O. HOOKER (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 6, pp. 368-373, pl. 1, figs. 3).—The variations in color of the precipitate formed with Fehling's solution and reducing materials are explained from the point of view of colloid chemistry. A microscopic examination of drops taken at intervals from a mixture of Fehling's solution and dextrose shows that, as the solution becomes more opaque and undergoes successive color changes from blue-green to red, the actively motile particles which are first noted gradually increase in size. These observations show that "the different colors observed in the reduction of Fehling's solution by dextrose (or other reducing substances) are nothing more than color changes coincident with a gradual increase in the size of copper oxid particles." The formation of intermediate colloidal substances is due to several factors among which are (1) too high a concentration of the reducing substance, resulting in the exhaustion of the copper salt while the copper oxid particles are still small, (2) the presence of various protective colloids which tend to stabilize the reduced copper oxid, (3) the stabilizing action of the intermediate products formed by the action of the alkali of Fehling's solution on the reducing substance when the latter is present in large amounts, and (4) too high a temperature giving less time for the formation of particles of the size characteristic of the red precipitate.

Contribution to the analysis of milk.—I, Determination of fat and casein without centrifugation; II, Agreement of the ratio casein: fat for the detection of skimming, F. REPIRON (*Ann. Chim. Analyt.*, 23 (1918), No. 1, pp. 11-15).—The following method for the analysis of milk is described:

By means of a copper-potassium hydroxid solution the casein of the milk is precipitated together with all the fat and some of the mineral salts. The precipitate, washed with dilute alcohol, is dried at 100° C. for four hours and weighed. This gives the weight of fat, casein, and mineral matter. The precipitate is then ashed and the amount of mineral matter calculated. The fat is determined by drying a 10 cc. sample of the milk with 5 gm. of sea sand and dissolving the fat with ether. The percentage of casein is calculated by difference.

The ratio casein:fat, as determined from a large number of analyses of milk, gives a maximum result of 0.82 for a pure unskimmed milk. Whenever this figure is exceeded it is deemed certain that other investigations would confirm the conclusion that the milk had been skimmed.

Determination of fatty acids in butter fat: I, E. B. HOLLAND and J. P. BUCKLEY, JR. (*Jour. Agr. Research [U. S.]*, 12 (1918), No. 11, pp. 719-732, figs. 2).—Continuing the work at the Massachusetts Experiment Station on butter fat, previously noted (E. S. R., 35, p. 111), the authors have devised a method for the determination of five of the fatty acids in butter by direct esterification of butter fat with consequent fractionation of the resulting esters. The method is as follows:

In a liter flask are placed 150 gm. of filtered fat, together with 400 cc. of alcohol previously charged with 8 gm. of dry hydrochloric acid, or 4 cc. of concentrated sulphuric acid, and about 25 glass beads. The flask is connected with a reflux condenser and the mixture boiled for 24 hours on a wire gauze. The contents of the flask are then cooled, and, after addition of 50 cc. of ether and 150 gm. of magnesium chlorid, transferred to a liter separatory funnel and allowed to stand until a clear separation is secured. After the lower alcohol layer is drawn off, the esters are carefully shaken several times with from 25 to 50 cc. of ether and 50 cc. of an alcoholic solution of magnesium chlorid and finally filtered into a 500 cc. distillation flask. The filter is extracted with ether which is run into the flask containing the alcohol layer and washings from the esters, and the process of separation and extraction is repeated to recover any occluded esters which are then combined with the original extract.

The distillation flask is connected with a 12 in. Liebig condenser and heated in a bath of superheated valve oil. The exposed portion of the flask should be covered with asbestos paper and the condenser filled with cold water which should not be allowed to circulate. The distillate between 85 and 365° C. is collected, combined with the distillate from a second portion of butter fat treated in the same way, and subjected to fractional distillation. The required temperature range of every fraction must be accurately established by analyses with the apparatus used. The fractions are collected in tared flasks, weighed, and the saponification and iodine numbers determined as rapidly as possible. From these data the percentage and weight of the different esters in the fractions and of the corresponding acids may be determined. A table is included giving the necessary data for these calculations.

Analytical data are given of the application of the method to a sample of dry filtered butter fat churned from sweet cream.

Distinguishing manila from all other "hard" rope fibers, C. E. SWETT (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 3, p. 227).—The method employed consists in treating the sample with a solution of bleaching powder acidulated with acetic acid and then with ammonia. The manila fibers take a russet-brown color while all other fibers turn cherry-red. The difference between the red and brown is most evident at the end of three or four minutes after fuming with ammonia. With practice it is possible to estimate the manila content of a rope to a single fiber.

Maple products, A. T. CHARRON (*Rpt. Min. Agr. Prov. Quebec, 1917, pp. 79-83*).—Analytical results are reported showing the danger of overconcentration of maple sirup to the point of the crystallization of some of the sugar, thereby reducing the amount of sirup and leading to the suspicion that the product had been adulterated with cane sugar. The samples under suspicion, while pure according to the legal standards, had a water content of less than 25 per cent, showing that the concentration had been pushed too far.

Analyses of suspected samples of maple sugar showed figures for total ash and lead number below the legal limit. The suggestion is made that this is a result of repeated crystallization of the product whereby a large amount of the pectin is removed from the sirup. Extreme purification of maple sugar deprives it of its special characteristics and prevents its being placed on the market as a pure maple product.

The influence of reducing sugars in the sugar-cane sap on the clarification of the juice in the carbonitation process for the manufacture of white sugar in Java, H. A. C. VAN DER JAGT (*Chem. Weekbl.*, 15 (1918), No. 8, pp. 228-242).—The fact that sugar cane which is used for the manufacture of sugar in Java contains varying amounts of reducing sugars, while beet sugar is almost glucose-free, is emphasized in a discussion of the De Haan carbonitation process and the Harloff acid thin-juice process as practiced in Java. A comparison of the double carbonitation processes as used in Europe and in Java is given in tabular form.

The evaporation of prunes, C. I. LEWIS, F. R. BROWN, and A. F. BARSS (*Oregon Sta. Bul.* 145 (1917), pp. 36, figs. 28).—This publication was issued in the interests of the standardization of prunes. Methods of harvesting, preparing, and evaporating the fruit are discussed and detailed descriptions given, illustrated by diagrams and photographs, of various types of evaporators.

Tables are given showing the effect of climatic conditions and drying time on the weight of the fruit. From investigations extending over a number of years the authors find that there is a loss ranging from 5 to 9 per cent in the drying percentage due to unfavorable weather conditions, particularly moisture. The proper moisture content of evaporated prunes is estimated at from 17 to 18 per cent. Data collected over a period of two years show that there is very little change in the drying percentage until the drying time becomes abnormally long, but that there is a marked difference in appearance, texture, and flavor of the fruit. These seem to be better when the drying time is relatively short.

Apple flakes, W. P. JAMES (*Illinois Sta. Circ.* 213 (1918), pp. 8, figs. 2).—This publication describes a new form of dried apple which is recommended as an army food. The product is prepared by peeling the entire apple with an ordinary apple peeler, mixing the prepared apple tissue with dry sugar in the proportions of 2 gm. of sugar to 10 gm. of apple tissue, and drying from 12 to 14 hours under mechanical conditions corresponding to those used in commercial drying. The resulting product can be packed in boxes as it comes from the drier or concentrated by powdering or compressing into small capsules, or made into a cake coated with powdered sugar and wrapped in tin-foil.

The advantages of the product are (1) the moisture content is low, which insures long keeping; (2) the physical structure of the tissues is such that the product can absorb water readily up to the original content; (3) the coloring is controlled without bleaching the tissues; (4) the flavor, sugar, acid, and probably the original food constituents are not appreciably affected; (5) the use of sugar gives an additional food value to the product; (6) the expense of production should be less than that of the sulphur-dried apple; and (7) the cost of transportation is reduced to the minimum. It is estimated that 25 tons of fresh apples would make approximately 2½ tons of dried product.

METEOROLOGY.

Climate, R. DEC. WARD (*New York and London: G. P. Putnam's Sons*, 1918, 2. ed., rev., pp. XV+380, figs. 34).—This is a second revised edition of a book previously noted (*E. S. R.*, 20, p. 812). In a prefatory note the author states

that in this edition he has made "some revision of the chapters on The Characteristics of the Polar Zones and on Changes of Climate, in order that these subjects may be more accurately presented in the light of recent investigations. A few other changes have also been made and all errors which occurred in the first edition have been corrected."

The diurnal variation of wind with height, L. DUNOYER and G. REBOUL (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 26, pp. 1068-1071; *abs. in Sci. Abs., Sect. A—Phys.*, 21 (1918), No. 243, p. 100).—"Results of observations with pilot balloons in France carried out at all hours of the day and night show that at heights of from 200 to 800 meters the diurnal variation of wind velocity shows a pronounced maximum during the night, especially when the surface wind is light and coming from the east. The effect is masked by the influence of depressions, and it is therefore not well shown with westerly winds."

On the relation between barometric pressure and the water level in a well at Kew Observatory, Richmond, E. G. BILHAM (*Proc. Roy. Soc. [London]*, *Ser. A*, 94 (1918), No. 658, pp. 165-181, *figs. 4*; *abs. in Sci. Abs., Sect. A—Phys.*, 21 (1918), No. 243, pp. 100, 101).—Observations are recorded which showed that "(1) at all seasons of the year the water level is sensitive to changes of pressure, a rise of the barometer being associated with a fall of water level and vice versa, (2) within certain limits the change of level is proportional to the change of pressure producing it, (3) the magnitude of the change of level produced by a given change of pressure increases rapidly as the subsoil water level rises, and (4) there is no appreciable lag in the response of the water level to changes of pressure." A possible explanation of the facts observed is suggested.

The divining rod, D. VAN GULIK (*Scot. Jour. Agr.*, 1 (1918), No. 2, p. 219).—The results are reported of tests to which four diviners were subjected by the Society of Natural Sciences of Wageningen, Holland, as follows: (1) Tracing underground streams and controlling their courses in a given area and (2) determining whether underground conduits were full of water or dry. The results indicated that any apparent success of the diviners was due to superficial control and their observation and previous knowledge of the ground. In the search for predetermined water currents, correct answers were obtained in 23 cases and incorrect in 25.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 4 (1917), Nos. 11, pp. 229, *pls. 3, figs. 3*; 12, pp. 232, *pls. 3, figs. 4*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1917, respectively.

Meteorological records for 1916 (*New York State Sta. Rpt.*, 1916, *pt. 1*, pp. 795-806).—Tables are given showing tridaily readings at Geneva, N. Y., of standard air thermometers for each month of the year; daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings for the year; monthly and yearly maximum and minimum temperatures from 1883 to 1916, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

Meteorological records for the years 1915 and 1916, H. L. PRICE (*Virginia Sta. Rpts.* 1915-16, pp. 209-213).—Tables are given which show tridaily readings of air temperature at Blacksburg, Va., during 1915 and 1916, as well as a monthly summary of observations on temperature, precipitation, winds, and cloudiness at this place during the same period.

Rainfall distribution over France, A. ANGOT (*Rev. in Symon's Met. Mag.*, 52 (1918), No. 624, pp. 136, 137; *abs. in Nature [London]*, 101 (1918), No. 2527, p. 95).—"This is the first portion of a contemplated large investigation into the rainfall distribution over France, and deals with the régime over the north-west Provinces. . . . The variability of rainfall based on records for sixteen stations in France, and adjacent countries during the second half of last century is discussed, from which it is shown that the departures of individual years from the normal are in accordance with the theory of probabilities. A list of the stations arranged in river basins is given by departments, along with the altitude and the period of observation. Monthly isohyets are drawn at intervals of 10 mm. up to 100 mm., but at 120 mm. and 150 mm. thereafter, while on the annual maps the intervals extend to 100 mm. A summary of the leading features governing the rainfall distribution is given for each month and for the year."

SOILS—FERTILIZERS.

Classification and measurement of the different forms of water in the soil by means of the dilatometer method, G. J. BOUYOUKOS (*Michigan Sta. Tech. Bul.* 36 (1917), pp. 48, figs. 5).—In a continuation of work previously noted (*E. S. R.*, 36, p. 719), the author presents additional data obtained by the dilatometer method on the condition in which moisture exists in the soil and its classification into free, capillary-absorbed, and combined, and describes the final form of the apparatus adopted and the procedure followed. The studies were directly and primarily suggested by work conducted by the author and McCool on the freezing-point lowering of soils (*E. S. R.*, 38, p. 16). The results of the examination of 73 agricultural soils, varying widely in nature and distribution, are reported showing the amount of water that failed to freeze under different moisture conditions and temperature treatments. In addition, certain miscellaneous materials were employed, including peat, muck, silica, lampblack, animal charcoal, quartz sand, and burnt clay, and observations were also made on the effect of salts (normal and tenth-normal sodium chlorid, calcium chlorid, sodium nitrate, calcium nitrate, potassium chlorid, calcium phosphate, and ammonium sulphate) upon the amount of water that failed to freeze. The investigations may be summarized as follows:

"For classifying the moisture into the various forms the following principle is followed: All the water in the soil that freezes at or slightly below 0° is considered free water because pure water in mass is known to freeze at this temperature. All the water that freezes from this temperature down to -78° C. is regarded as capillary-adsorbed water, while all the water that fails to freeze is considered as combined water.

"The procedure of the method consists of mixing soil and water in the bulb of the dilatometer in certain proportions (25 grains of air-dry soil and 5 or 10 cc. of water), filling the dilatometer with ligroin, care being taken to expel as much air from the soil as possible, and then cooling the soil to the desired temperature. For determining the free water the soil is supercooled only once to the temperature of -1.5°; for determining the capillary-adsorbed water the soil is frozen and thawed several times and then supercooled to -4° and also cooled in the temperature of -78°. The combined water is obtained by the difference."

In soils supercooled only once to the temperature of -1.5° the amount of water which failed to freeze varied from 0 cc. in quartz sand to about 4.25 cc. in some clays, or from 0 to 85 per cent on the basis of the amount of water added, or from 0 to 21.88 per cent on the absolute dry basis. As a general rule

it increased from the coarse-textured or noncolloidal to the fine-textured or colloidal classes of soil. In soils frozen and thawed several times and finally supercooled to -4° and also cooled in -78° the amount of water which failed to freeze varied from 0 cc. in quartz sand to about 2 cc. in some clays, or from 0 to 40 per cent of the amount of water added, or from 0 to 12.5 per cent on the absolute dry basis. It also increased from the coarse-textured to the fine-textured classes of soil. "The results at these temperatures are the same as those at the temperature of -1.5° with two important exceptions: First, the amount of water which failed to freeze at the temperature of -4° and -78° is considerably smaller than that at the temperature of -1.5° Second, the relative amounts of water which refused to freeze at the two sets of temperatures are not the same in the various soils." In artificial substances the amount of water that failed to freeze varied from 0 per cent in quartz sand to 2 per cent in lampblack, to 32 per cent in silica, and to 60 per cent in peat, on the absolute dry basis.

"When the amount of water which freezes and does not freeze at the various temperatures is classified into free, capillary-adsorbed, and combined, by the method described, it is found that the water in the soil does exist in these forms and that the amount of these forms varies tremendously in the various soils." In the sands and fine sandy loams the free water predominates, amounting in some cases to about 95 per cent of the total water present, and the other 5 per cent consisting as a rule of combined water, capillary-adsorbed water apparently not being present in these classes of soil. In the loams and silt loams the free and combined water predominates, capillary-adsorbed water being present in small amounts. In some of the heavy loams all three forms were about equally distributed. In clay loams, humus loams, and clay, combined water predominated, followed by capillary-adsorbed and free. "Although the amount of free water tends to decrease and the amount of the capillary-adsorbed and combined water tends to increase correspondingly as the soils ascend from the simple and noncolloidal to the complex and colloidal classes there are many exceptions to this rule.

"The amount of water which fails to freeze is not influenced by the moisture content present if the soils are frozen and thawed several times before the final determination is made. If the determination is made at the first freezing then the amount of water which fails to freeze is much greater at the low than at the high moisture content. This is true, however, only in the fine-textured or colloidal and not in the coarse-textured or noncolloidal types of soil. Repeated freezing and thawing decreases the amount of water which fails to freeze in the case of the fine-textured or colloidal soils. This is true, however, only at a low and not at a high moisture content. The results of the coarse or noncolloidal soils remain unaffected at both the high and low moisture content. The degree of supercooling, up to a certain point, influences to a slight extent the amount of water which refuses to freeze. This is particularly true in the heavier classes of soil. Cooling the soil at the temperature of -78° causes very little if any additional water to freeze above that which freezes at the temperature of -4° . The only substances in which the additional amount is considerable are lampblack, animal charcoal, and silica.

"Small concentration of the soil solution affects the amount of water which fails to freeze very little, if any. Great concentration, however, affects it greatly. The concentration of the solution of normal soils is too small to affect it to any measurable extent.

"There is no correlation between the factor of the amount of water which fails to freeze and the moisture content of soils known as wilting coefficient and moisture equivalent, in degree, but there is in order. The same is more or

less true in the case of the hygroscopic moisture content. There is, however, a very close relation between the amount of water which fails to freeze and the lowering of the freezing point of soils. There is also no definite and consistent correlation between the factor of the amount of water which fails to freeze and the class of soil as determined by the mechanical analysis method.

"The greatest and most important value of the dilatometer method lies in its ability to show the behavior of soils toward water and to classify the water quite accurately into free, capillary-adsorbed, and combined. The combined water seems to be composed of water of hydration and solid solution of water, with the former probably predominating. This problem, however, is considered still unsolved. The factors which cause the water to be in the combined form appear to be the colloids and the chemical composition of the soil. The size of particles or surface of the soil does not seem to play the leading rôle in this form of water. If it does, then it has to be assumed that the surface of different materials holds the water with entirely different degrees of tenacity or compressibility. The results yielded by the dilatometer method are of great importance not only per se but also in throwing new light upon many other soil problems, such as movement of moisture in soils, evaporation of water from soils, etc. The results are fundamental and basic."

The soil solution obtained by the oil pressure method, J. F. MORGAN (*Michigan Sta. Tech. Bul.* 28 (1916), pp. 7-38, figs. 6).—This presents a more detailed account of work previously noted (*E. S. R.*, 37, p. 717).

Effect of soil moisture on growth and maturity in maize, T. B. HUTCHESON and T. K. WOLFE (*Virginia Sta. Tech. Bul.* 14 (1917), pp. 73-92; *Rpts.* 1915-16, pp. 73-92).—Corn was grown in galvanized iron pots 11½ in. in diameter and 14 in. in height, filled with a mixture of silt loam field soil and greenhouse soil that had been composted and was rich in organic matter. The moisture was maintained in different series at 40 and 70 per cent of saturation continuously or for varying periods or at various combinations of these percentages.

The results show that "for early maturity and high yield in the corn plant, optimum soil moisture should be present throughout the period of growth. Alternate wetting and drying of the soil produces early maturity of the corn plant and high yield of dry matter second only to those plants grown under optimum conditions of soil moisture. Contrary to the opinion of many corn growers, the highest yields of dry matter are obtained when optimum soil moisture is present in the early stages of growth of the plant, rather than at earing time. This condition also hastens maturity. The critical time in the life of the corn plant in regard to both early maturity and high yields, as far as soil moisture is concerned, is in the early stages of growth. The optimum soil moisture content in the later stages of growth of the corn plant, following periods of low soil moisture, retards maturity and lessens the yield. This experiment was carried on in pots in the greenhouse, and whether these results would apply to field conditions the writers can not say."

A list of 22 references to literature bearing on the subject is given.

Soil survey of Wilcox County, Ala., R. A. WINSTON and N. E. BELL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils*, 1916, pp. 71, fig. 1, map 1).—This survey, made in cooperation with the State of Alabama, deals with the soils of an area of 576,000 acres in the south-central part of the State lying wholly within the drainage basin of the Alabama River. The topography of the county ranges from undulating to hilly, with elevations above sea level of from 275 ft. in the southern part to 475 ft. in the northern part.

The soils of the county are classed as upland and alluvial, the former being derived from the weathering of marine deposits, chiefly unconsolidated sands,

sandy clays, and clays, with small areas of black prairie soils derived from soft, chalky, or partially indurated limestone, and the latter being of recent alluvial origin. Thirty-five soil types of 19 series are mapped, the soils ranging from loose, incoherent sands to heavy, sticky clays. Susquehanna clay and Susquehanna fine sandy loam predominate, occupying 15.6 and 14.3 per cent of the total area, respectively.

Soil survey of Hinds County, Miss., A. E. KOCHER and A. L. GOODMAN (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 42, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the State of Mississippi, deals with the soils of an area of 558,080 acres lying just southwest of the center of the State. The topography of the county varies from smooth or gently rolling to steeply sloping, the greater part of the area having a rolling surface. Extensive level areas occur along the principal streams as terraces and first bottoms. Drainage is chiefly by the Big Black and Pearl Rivers and their tributaries and is well established.

The upland soils of the county, comprising about five-eighths of its area, are derived from loessial material, except for a small portion of coastal plain and Vicksburg limestone origin. The alluvial soils are derived from material washed from the drainage basins of the streams and deposited over their flood plains. Grenada silt loam, Memphis silt loam, Olivier silt loam, and Collins silt loam predominate, occupying 45.8, 15.5, 14.1, and 13.6 per cent of the total area, respectively.

Soil survey of Lee County, Miss., W. E. THARP and E. M. JONES (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 40, fig. 1, map 1*).—This survey, made in cooperation with the State of Mississippi, deals with the soils of an area of 286,720 acres located in the northeastern part of the State. The topography of the county is generally undulating to strongly rolling, a part of the east-central section being hilly. Comparatively wide bottoms occur along the many small streams.

"The region is underlain by the Selma Chalk, a soft, impure, bluish-gray lime rock that weathers rapidly upon exposure. . . . This rock is exposed in many places, and throughout considerable areas it is covered by only a thin layer of residual material, of which the rock itself has contributed the greater part. Its direct influence upon the soils would be greater were it not for the presence of a yellowish silty clay on most of the broader divides, termed in geological literature the Yellow Loam. In the eastern part of the county there are large areas whose surface formation consists of rather deeply weathered sands. These three formations . . . constitute the parent material of all the soils of the county." Excluding chalk (Houston material), 20 soil types of 12 series are mapped. Oktibbeha clay, Ruston fine sandy loam, and Pheba fine sandy loam predominate, occupying 17, 14.3, and 11.2 per cent of the total area, respectively.

Increasing crop yields for war needs, A. T. WIANCKO (*Indiana Sta. Circ. 76 (1918), pp. 7, fig. 1*).—The necessity of increased production per acre rather than increased acreage under present conditions is emphasized. Such fundamental factors as good crop rotations, tile drainage of wet lands, liming, and the use of stable manure, crop residues, and commercial fertilizers are briefly outlined as the principal means of increasing yields.

To fertilize is patriotic and profitable, DEF. HUNGERFORD and W. E. AYRES (*Arkansas Sta. Circ. 32 [1918], pp. 4*).—The results of fertilizer tests with corn at 13 different places and with cotton at 8 places in Arkansas, covering 1 to 8 seasons during the period from 1908 to 1917 are summarized. The fertilizers used were cotton-seed meal, approximately 200 lbs. per acre, nitrate of

soda 100 lbs., acid phosphate 300 lbs., muriate of potash 50 lbs., and manure 7 tons, the same amounts being used whether the materials were applied alone or in combination.

The average yield of all unfertilized plats was 22.5 bu. of corn and 565 lbs. of seed cotton per acre. With acid phosphate the increased yield of corn was 0.7 bu., produced at a financial loss. The increase with nitrate of soda was 5.1 bu., valued at \$6.20, with cottonseed meal 4.4 bu., worth \$3.80, phosphate and nitrate 7.5 bu., worth \$7, complete fertilizer 8.6 bu., worth \$17.20, and manure 8.3 bu., worth \$16.60. For cotton the respective increases of seed cotton and estimated profits per acre were 62 lbs. and \$16.40, 86 lbs. and \$21.80, 100 lbs. and \$25, 104 lbs. and \$23.20, 134 lbs. and \$40.20, and 156 lbs. and \$46.80.

The results of fertilizer experiments with corn and cotton at the Alabama, Mississippi, and South Carolina stations are also briefly summarized and stated to corroborate the Arkansas results.

Recommendations are made regarding the use of fertilizers in 1918.

Fertilizer experiments on DeKalb soils, J. W. WHITE (*Pennsylvania Sta. Bul. 151 (1918), pp. 3-12, figs. 9.*)—Based on work previously noted (E. S. R., 38, p. 219), permanent field experiments begun in 1916 are described which embrace a study of the effect upon depleted DeKalb soil abandoned for 40 years of various combinations of commercial fertilizers, limestones, and manure in a four-year rotation of corn, oats, wheat, and grass, and on permanent pasture land. The results of the first year's growth of clover and pasture grasses are noted in tabular form, together with the annual cost of the fertilizer treatments.

The use of acid phosphate and limestone resulted in a higher yield than lime and rock phosphate, although the latter was used in amounts four times that of the acid phosphate. When the same materials were used with manure the differences were less marked. A comparison of applications of various amounts of acid phosphate indicated that the yields were in the order of the amounts applied. An application of 600 lbs. per acre is deemed most economical for the first treatment.

A ten-year study of the effect of fertilizers on the soluble plant food in the soil and on the crop yield, W. B. ELLETT and H. H. HILL (*Virginia Sta. Tech. Bul. 13 (1917), pp. 46-72, fig. 1; Rpts. 1915-16, pp. 46-72, fig. 1.*)—Chemical investigations and fertilizer experiments are reviewed which show that Virginia soils derived from different geological formations are deficient in available phosphoric acid and respond to available phosphatic fertilizers.

"Certain soil types containing large quantities of iron and alumina possess the power of retaining or fixing the phosphoric acid when applied in soluble forms. This fixation is as great in some soils as 95 per cent. The soils of the older geological formations possess the greatest fixing power, while those of more recent origin fix the least. The latter type has a fixing value of about 17 per cent.

"In cylinder experiments where the soils were fertilized with salts prepared in the laboratory, fifth-normal nitric acid failed to show the true availability of these salts as compared with the crop yields. When the soils from the plats were extracted with fifth-normal nitric acid . . . it was found that the P_2O_5 increased with each annual application of phosphate from the three sources. Therefore the reserve supply of P_2O_5 is being built up and it is reasonable to suppose that this reserve supply will continue to increase from year to year. It is shown that on soils of the Hagerstown series relatively the same amounts of P_2O_5 are taken up by the plant or fixed by the soil regardless of whether the P_2O_5 is applied to the soil in the form of acid phosphate, floats or Thomas slag. This is borne out by the average yields for nine years.

"From the results obtained on a plat receiving an annual application of 1,200 lbs. of lime, it is shown that the lime factor plays a more important part than would be expected on soils of this type."

A study of the bacteriology of fresh and decomposing manure, T. J. MURRAY (*Virginia Sta. Tech. Bul. 15 (1917), pp. 103-117, fig. 1; Rpts. 1915-16, pp. 103-117, fig. 1*).—"Samples were taken first of fresh and then decomposing manure at monthly intervals for a period of six months. The samples were plated on beef peptone agar, synthetic agar, and nitrogen-poor agar under aerobic and anaerobic conditions. The number of bacteria per gram was estimated on these media under these conditions. The percentage of facultative anaerobes was estimated by growing several cultures from the anaerobic plates under aerobic conditions. The percentage of organisms facultative in regard to nitrogen-poor and synthetic media was also estimated. From a high dilution plate of beef peptone agar, one on which there was approximately 100 colonies, all the bacteria were picked and inoculated on agar slants. These cultures were stained by the Gram method and run down through a series of physiological culture media; their chemical activities were studied and the organisms identified. The following things were noted:

"Higher counts were obtained on beef peptone agar than on any other medium. For the first four periods higher counts were obtained on Winogradski nitrogen-poor media. Thereafter higher counts were obtained on synthetic media. Anywhere from 12 [million] to 43 million organisms per gram were found on beef peptone agar. There is no progressive increase or decrease throughout the six months. There are always, with one possible exception, the first month, more aerobes than anaerobes. The anaerobic count on beef peptone agar varied from 1,265,000 to 35,400,000 bacteria per gram. From 60 to 100 per cent of the anaerobes on beef peptone agar were facultative in regard to air. From 73 to 92 per cent of bacteria that developed on synthetic agar were facultative in regard to beef peptone agar. From 77 to 96 per cent of the bacteria that developed on Winogradski nitrogen-poor media were facultative in regard to beef peptone agar.

"In the first month before any fermentation had taken place 65.5 per cent of the organisms isolated and studied were *Bacillus coli*. The remainder were very closely related. During the second month *B. coli* was present to the extent of 8 per cent. Thereafter it was entirely missing. After one month there is always a predominating type of bacterium, usually a gram-positive spore-forming, strepto-bacillus. Usually there are more spore-forming bacteria than nonspore-forming organisms present. Ammonifying organisms are present throughout all the work. Every organism isolated formed ammonia from peptone. For the first two periods proteolytic bacteria are practically missing. Thereafter there is a progressive increase and during the last month practically all the bacteria are of this type. Denitrifying bacteria of two types are present, those that form nitrites from nitrates and those that form free nitrogen from nitrites.

"The type that forms nitrites from nitrates is present throughout. There is a progressive decrease from 100 per cent in the fresh manure to 50 per cent in the last sample of decomposed manure. The other type is present, with one exception, throughout. These organisms that give off free nitrogen are always in the minority, although in the period one month after the fermentation had started there were as many as 17 per cent present."

Effect of nitrifying bacteria on the solubility of tricalcium phosphate, W. P. KELLEY (*Jour. Agr. Research [U. S.], 12 (1918), No. 10, pp. 671-683*).—An account is given of a study made at Citrus Experiment Station, Cal., of the effects (1) of added calcium carbonate, tricalcium phosphate, and ammonium

sulphate on the solubility of calcium and phosphoric acid in a light sandy loam soil; (2) of nitrification of the soil nitrogen, ammonium sulphate, and dried blood on the solubility of the calcium and phosphoric acid naturally occurring in soils; and (3) of nitrification in soil and sand cultures on the solubility of tricalcium phosphate, both with and without the addition of calcium carbonate.

To portions of 2,000 gm. each of fresh soil (or sand) in half-gallon fruit jars a solution of ammonium sulphate was added at rates supplying 0.01 gm. of nitrogen per 100 gm. of dry soil; to other portions an equal quantity of nitrogen was added in the form of dried blood; to still other portions no nitrogenous substance was added. Tricalcium phosphate was added in certain cases at the rate of 0.1 gm. per 100 gm. of soil and calcium carbonate at the rate of 0.25 gm. per 100 gm. of soil. After a thorough mixing of their contents, adding suitable amounts of water and mixing again, the jars were loosely covered and incubated at room temperature. Tests were made immediately after the mixing of the materials, which served as a basis for correction for solubility in water and ammonium sulphate solution without the intervention of bacteria. The nitric nitrogen and water-soluble calcium and phosphoric acid were determined after incubation periods of 28, 57, and 137 days.

The results obtained showed that "the addition of calcium carbonate produced no effect on the immediate solubility of the soil calcium or that added as tricalcium phosphate. The addition of tricalcium phosphate produced an increase of about 5 parts per million of soluble calcium and 11.2 parts per million of soluble phosphoric acid, while the addition of ammonium sulphate brought about an increase in water-soluble calcium from 27.5 to 90.1 parts per million.

"Active nitrification of ammonium sulphate and dried blood took place in the soil series, and at the same time notable increases in soluble calcium were produced. No increase in the solubility in water of the soil phosphates or of tricalcium phosphate was produced by bacterial action except in the nitrification of ammonium sulphate when added without calcium carbonate. In this case 0.156 lbs. (70.8 gm.) of phosphorus were dissolved for every pound of nitrogen oxidized. . . . The addition of calcium carbonate brought about an increase in soluble calcium but tended to lower the solubility of tricalcium phosphate.

"In the absence of calcium carbonate the nitrification of ammonium sulphate in sand cultures was accompanied by the solution of theoretical amounts of tricalcium phosphate. When calcium carbonate was present, however, the solubility of tricalcium phosphate was not increased by nitrification. The formation of nitrite from dried blood took place more rapidly in the sand cultures than the formation of nitrate. Tricalcium phosphate was not dissolved by the nitrification of dried blood in the sand series. It was found that calcium carbonate promoted more active nitrification than tricalcium phosphate.

"The experimental results indicate that the nitrification of organic forms of nitrogen does not increase the solubility of rock phosphate under field conditions that are favorable to crop growth. It is possible, however, that the nitrification of ammonium sulphate may result in the solution of small amounts of tricalcium phosphate in soil low in carbonate."

Nine references to literature cited are given.

Pot experiments to determine primarily the availability of phosphoric acid in Thomas slag phosphates in comparison with other phosphates, W. B. ELLETT and A. A. INGHAM (*Virginia Sta. Tech. Bul. 16 (1917), pp. 118-136, figs. 9; Rpts. 1915-16, pp. 118-136, figs. 9*).—This bulletin reports pot experiments made in cooperation with the Association of Official Agricultural Chemists.

"The soil used for these experiments was deficient in nitrogen, lime, and phosphorus in available forms. A comparison of the availabilities of the various phosphatic materials, as measured by crop yields, was made. The availability of the four slag phosphates was about equal . . .

"As regards the slag phosphate no correlation is shown between the crop yield and the percentages of available phosphoric acid obtained by the 2 per cent citric-acid method of analysis. When sodium phosphate, double superphosphate, and acid phosphate are compared, their availabilities are seen to fall in the order named, which agrees with the analyses secured by the official ammonium citrate method. Where ground phosphate rock (floats) was used the crop yields obtained indicate that this material is of very little value in furnishing phosphoric acid on this soil type. No appreciable increase in the availability of this material was shown by the turning under of a legume crop."

Phosphorus carriers in commercial fertilizers, C. E. THORNE (*Mo. Bul Ohio Sta.*, 3 (1918), No. 3, pp. 79-81, figs. 2).—A comparison of acid phosphate, dissolved boneblack, basic slag, and bone meal as phosphorus carriers in complete commercial fertilizers used in 3 and 5-year rotations at Wooster for 24 years, and in a 5-year rotation at Strongsville for 22 years, on both limed and unlimed soil, has led to the conclusion that, based on the total increase in yield of both grain and straw, and on the value of the increase from each treatment, the relative order of effectiveness with acid phosphate as 100 has averaged 92 for basic slag and 86 each for steamed bone meal and dissolved boneblack. Basic slag was slightly more effective on unlimed than on limed land, but not enough more to obviate the necessity for liming. The experiments are also held to indicate that no allowance should be made for the nitrogen carried by the bone meal.

Availability of ground limestone of different degrees of fineness, T. B. HUTCHESON, T. J. MURRAY, and T. K. WOLFE (*Virginia Sta. Rpts. 1915-16*, pp. 171-178, fig. 1).—In a study on greenhouse plats of red shale soil of the effect of limestone of different degrees of fineness (10 to 20 mesh, 40 to 60 mesh, 100 mesh, and equal parts of each size) on crop yield, nitrate formation, and number of bacteria in the soil, it was found "that the yield of rape and the number of bacteria increased as the fineness of limestone increased. The effect of limestone on nitrate production showed some variation. However, the inclosed areas in the plat which received the finest grade of limestone contained the highest amount of nitrates, and the inclosed areas of the check plat the least amount. It seems that when rape is grown on this type of soil the chief limiting factor in maximum production is lime."

Report of analyses of samples of commercial fertilizers collected by the commissioner of agriculture during 1917 (*New York State Sta. Bul. 440* [1917], pp. 523-584).—This reports the guaranteed and actual analyses of official samples of fertilizers and fertilizer ingredients collected during 1917.

AGRICULTURAL BOTANY.

Methods of studying permeability of protoplasm to salts, S. C. BROOKS (*Bot. Gaz.*, 64 (1917), No. 3, pp. 230-249).—Intensive study (E. S. R., 34, p. 326) of methods heretofore employed to investigate the permeability of protoplasm to electrolytes, and of the evidences obtained by means of such methods, is claimed to have shown that apparent conflicts may be due in large part to imperfect understanding of the limitations of such methods or to unwarranted assumptions regarding the nature and reactions of living matter.

In this article, which is regarded as preliminary, the author confines himself chiefly to critical consideration of the methods previously employed, which are

said to fall into four general categories in which the criteria employed are chemical analysis of tissue extracts or of solutions bathing the tissues, visible changes within the cell, turgidity of cells or tissues, and electrical conductivity of tissues or of masses of cells. To these the author adds a diffusion method which is described in the paper noted below.

A new method of studying permeability, S. C. BROOKS (*Bot. Gaz.*, 64 (1917), No. 4, pp. 306-317, figs. 2).—Having set forth in the paper above noted the desirability of a study of permeability by some method which should be independent of other methods and should yield data not depending for interpretation upon unverified assumptions, the author herein presents the method proposed by him, which is considered to fulfill such requirements. This method is claimed to have revealed errors previously made in the interpretation of data secured by different methods or in the validity of conclusions based upon such data.

The method as here detailed, with the results obtained therefrom, depends upon the diffusion of salts or other substances through a diaphragm of living tissue, satisfactory material for the purpose having been found in the fronds of *Laminaria agardhii* (*L. saccharina*). It is stated that the protoplasm of *Laminaria* is normally permeable to the salts of sea water. Salts of sodium cause an increase of permeability ending in death, and salts of calcium and lanthanum cause first a decrease and later an increase resulting in death.

Influence of hydrogen ion concentration of medium on the reproduction of alfalfa bacteria, E. B. FRED and N. E. LOOMIS (*Jour. Bact.*, 2 (1917), No. 6, pp. 629-633, fig. 1).—An attempt to study the effect of reaction (hydrogen ion concentration) on the growth of *Bacillus radicola* has given data which show the difference between the concentration of hydrogen ions and the total concentration of acid or alkali. The change in the hydrogen ion concentration is much greater with increase in acidity than with corresponding increase in alkalinity, especially after bacterial growth has continued for two weeks. Plate counts after such period indicate that *B. radicola* is much more sensitive to sulphuric acid in mannitol solution than to gram-equivalent amounts of sodium hydroxid. The growth for different species of legume bacteria in culture media of varying hydrogen ion concentrations is to be dealt with in a later paper.

The effect of different plant tissues on the fixation of atmospheric nitrogen, T. J. MURRAY (*Virginia Sta. Tech. Bul.* 15 (1917), pp. 93-102; *Ann. Rpts.* 1915, 1916, pp. 93-102).—The dried and ground tissues of 21 different grasses, forage plants, and vegetables were added at the rate of 1 per cent in series of 300-gm. samples of silt loam and sand in 1-qt. glass jars and incubated at 28° C., nitrogen being determined immediately and after 2, 4, and 6-month intervals. All of the substances except three stimulated nitrogen fixation in the soil. Nine of them failed to show any stimulating effect and twelve only slight stimulation in sand.

The endotrophic mycorrhiza of Ericaceæ, J. DUFÉNOY (*New Phytol.*, 16 (1917), No. 8-9, pp. 222-228, figs. 4).—A study of *Arbutus unedo* is said to support the view that symbiosis with endophytes is a general rule for at least the Orchidaceæ and the Ericaceæ. It is claimed also that the so-called symbiosis is in reality a form of parasitism in which an equilibrium exists between the invading power of the fungus and the resisting power of the host, profitable to both so long as it is maintained but eventuating in disadvantage or death to either one if sufficient advantage is gained by the other symbiont.

The effect of certain rusts upon the transpiration of their hosts, J. E. WEAVER (*Minn. Bot. Studies*, 4 (1916), pt. 4, pp. 379-406, pls. 2, figs. 9).—Reporting results of experiments during 1914-15 with rust-infected and healthy

plants of 8 different species, of which the transpiration was measured for more than 200 individuals, the author states that without exception the presence of even a small amount of cereal rust accelerates decidedly the transpiration rate for a long period, beginning about the time that the pustules break through the epidermis. A very close quantitative relationship was established between the amount of pustular area and the increase in transpiration, but this is not held to be due wholly to the torn epidermal surface. It is thought that under conditions brought about by disease the transpiration rate might become so excessive as to hinder the normal activities of the plant.

Response of microorganisms to copper sulphate treatment, N. L. HUFF (*Minn. Bot. Studies*, 4 (1916), pt. 4, pp. 407-425, figs. 5).—Noting the effect, as brought out by tests in 1915, of copper sulphate on microorganisms in Vadnais Lake, which furnishes water for the city of St. Paul, the author states that a concentration of 1:12,000,000 is adequate for the elimination of *Spirogyra*, *Cyclotella*, and most of the *Cyanophyceæ*. A strength of 1:10,000,000 is effective in destroying all the forms listed, with the possible exception of *Eudorina* and *Pandorina*. Such an application remains effective for about five weeks, after which time the organisms may increase with remarkable rapidity.

A new plant producing hydrocyanic acid, M. MIRANDE (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 21, pp. 717, 718).—The author claims to have demonstrated the presence of hydrocyanic acid in *Isopyrum thalictroides* and to have found the same acid along with other products in *I. fumaroides*. It is stated that this plant agrees with the rule to which a few exceptions exist in regard to plants producing cyanogen, namely, that there is a correspondence between the hydrocyanic acid content and the yellow color of the plant.

Fats from *Rhus laurina* and *R. diversiloba*, J. B. MCNAB (*Bot. Gaz.*, 64 (1917), No. 4, pp. 330-336, fig. 1).—The author attempted to ascertain whether the fats from *R. laurina* and *R. diversiloba* are identical with Japan wax, and to determine any connection existing between this fat and the poisonous properties of *R. diversiloba*. He reports that he obtained substances from ripe fruits of these plants resembling Japan wax more than any other fat, and that an increase in the fat content occurred coincidentally with a decrease in the toxicity of the ripening fruit, which decrease culminated in its becoming nontoxic. This final phenomenon is considered not to be due to a chemical transformation of the poison into fat, for reasons which are stated.

The excretion of acids by roots, H. COUPIN (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 17, pp. 564-566).—Having carried out a series of studies regarding the excretion of acids by roots, the author states that this is really the work, not of the root hairs, but of the superficial cells of the rootlet itself. This work is participated in by the portion between the root hairs and the root tip, also by the portions from which these processes have disappeared. It is stated also that this production of acid is more active at points of injury to the superficial cells of the rootlet.

On some criticisms of the osazone method of detecting sugars in plant tissues, S. MANGHAM (*New Phytol.*, 16 (1917), No. 3-9, pp. 236-240).—This is a reply to discussions by several persons of the author's report on the osazone method as previously noted (*E. S. R.*, 34, p. 729).

The adaptation of Truog's method for the determination of carbon dioxide to plant respiration studies, A. M. GURJAR (*Plant World*, 20 (1917), No. 9, pp. 288-293, fig. 1).—In the preliminary work on respiration in the stored grain now being carried on by the author, it has become evident that the method of carbon dioxide determination must accomplish rapid removal of the carbon dioxide and must accommodate the wide variations met with in its amount without materially impairing accuracy. The author describes the arrangement

and operation of the apparatus which has been worked out with these ends in view, and which is considered to satisfy these requirements, as it has been used with very satisfactory results.

Observations on the influence of aeration of the nutrient solution in water culture experiments, with some remarks on the water cultural method, W. STILES and I. JÖRGENSEN (*New Phytol.*, 16 (1917), No. 8-9, pp. 181-197).—In a review of the development and the employment of the water culture method of measuring growth in plants during the past, the authors emphasize the complexity of the problems encountered in this work, illustrating this feature in relation especially to aeration. Agreements and differences are noted between the work of the authors (E. S. R., 33, p. 521; 36, p. 731), and that of other investigators.

It is held that water culture conditions react in a different manner on different species. The attainment of definiteness requires much work on the physical chemistry of water cultures, and investigation needs to be extended as regards the dynamical principles involved. The cooperation of the various activities of the plant must be recognized as a factor. It is regarded as desirable that a working principle in regard to the physiological relations of plant processes be evolved which may embody the activities of both sub-aerial and subterranean parts of the plant.

The physiological requirements of wheat and soy beans growing in sand media, A. G. MCCALL (*Proc. Soc. Prom. Agr. Sci.*, 37 (1916), pp. 46-59, figs. 5).—The author has carried out the preliminary portion of a general plan for the study of the fertilizer requirements of farm crops at the Maryland Experiment Station. The pots used and the method of manipulation have been described previously (E. S. R., 36, p. 212). The medium employed was the three-salt solution used by Shive (E. S. R., 34, p. 333).

Wheat and soy beans were studied during the first 24 days of their growth, and the data are given in tabular and graphical form, showing among other facts that the proportions of nutrient salts which gave the highest growth rate for wheat also gave the highest rate for soy beans. It appears also that the total loss from transpiration is proportional to the growth rate of the plant during the given time (within the limits here employed).

A feature considered as important is the regularity with which both the growth curve and the transpiration curve rise in correspondence with an increase of calcium nitrate and a decrease of magnesium sulphate.

This study is to be extended to other important field crops.

The interpretation and application of certain terms and concepts in the ecological classification of plant communities, G. E. NICHOLS (*Plant World*, 20 (1917), Nos. 10, pp. 305-319; 11, pp. 341-353).—The author has attempted to work out a logical and adequate, yet simple and somewhat elastic, scheme of ecological classification readily adaptable to employment for the vegetation of any given region, the groundwork for such a classification being afforded by the principle of succession.

The fundamental unit of vegetation is the association. The associations of a unit physiographic area constitute an edaphic formation. The edaphic formations of a unit climatic area, taken collectively, constitute a climatic formation. The climatic formations of the earth constitute the terrestrial formation. The association is determined by habitat, the edaphic formation by physiography, the climatic formation by climate, and the terrestrial formation by the atmosphere. These are synoptically arranged, and the employment of the scheme in practice is partly illustrated as applied to the vegetation of northern Cape Breton Island.

Root systems of certain desert plants, M. S. MARKLE (*Bot. Gaz.*, 64 (1917), No. 3, pp. 177-205, figs. 33).—The author has carried out a study of root systems in the region near Albuquerque, N. Mex., which presents certain contrasts with that near Tucson, Ariz., studied by Cannon (*E. S. R.*, 26, p. 728). In the report herein noted he has employed that author's classification of root systems.

The region around Albuquerque has a lower rainfall and winter temperature than prevail in that around Tucson. The soil is fluviatile and diverse as regards composition, somewhat lacking as regards the hardpan layer development noted at Tucson, also as regards the winter annuals and the larger shrubs and cacti, most of the plants being perennial herbs. The roots usually penetrate rather deeply, but they often show prominent laterals near the surface. Cacti and some shrubs have very superficial root systems, the larger cacti showing differentiation into anchorage and absorptive roots. Plants on the banks of arroyos may have prominent tap roots corresponding in length to the height of the plant above the arroyo bottom. Storage roots are uncommon except in the moister situations. Vegetative reproduction from roots is common in unstable soil. Variation in penetrability and in moisture content of soil are two influential factors in root variation. The roots of the plants of an association are grouped into rather definite layers, the result of which is to lessen the root competition by which the composition of an association is supposedly determined.

Cryoscopic determinations on tissue fluids of plants of Jamaican coastal deserts, J. A. HARRIS and J. V. LAWRENCE (*Bot. Gaz.*, 64 (1917), No. 4, pp. 285-305).—The authors have regarded the physicochemical properties of vegetable saps as important in ecology and phytogeography for reasons detailed in a paper previously noted (*E. S. R.*, 36, p. 823), and have found conspicuous differences in osmotic concentration between the tissue fluids of plants in the Tucson and in the Cold Spring Harbor regions (*E. S. R.*, 33, p. 628). They have selected for comparison with these areas the forested region of Jamaica described by Shreve (*E. S. R.*, 32, p. 748), and studied this during the winter and spring of 1915, obtaining data some of which are reserved for future publication. The present paper contains the results of freezing-point determinations of tissue fluids of plants of this region and comparisons thereof with those from other regions, with tentative suggestions regarding the causes of peculiarities observed.

Taken as a whole, the species here considered show tissue-fluid concentrations as high as, or higher than, those of fairly comparable growth forms in the Arizona deserts, the concentrations of the leaf saps of ligneous forms averaging two or three times as high as those in mesophytic regions. Plants of rocky slopes here show higher concentrations than do those of rocky slopes of the Arizona deserts, but their constants are decidedly lower than those of the coastal flats. The sap of the cacti is much less concentrated than is that of the hard or succulent leaves of the trees and half-shrubs among which they stand. Suggestions are offered regarding the causes of the differences observed.

Leaf structure as related to environment, H. C. HANSON (*Amer. Jour. Bot.*, 4 (1917), No. 9, pp. 553-560, figs. 21).—This is a study of the developmental differences observable between leaves growing in full sunshine at the south periphery of different trees and those growing in the crown of the same trees.

The origin and development of the Compositæ.—II, The pollen-presentation mechanism, J. SMALL (*New Phytol.*, 16 (1917), No. 8-9, pp. 198-221, figs. 4).—The styles of the Compositæ are said to be reducible to 14 types, the stamens to 16. In discussions given of the appendages in connection with their functions, the phylogenetic significance of both styles and stamens is also discussed.

An attempt to modify the germ plasm of *Oenothera* through the germinating seed, R. T. HANCE (*Amer. Nat.*, 51 (1917), No. 609, pp. 567-572).—Seeking to find chemicals capable of modifying the structure of the germ plasm or of bringing about irregularities in the distribution of the chromosomes, the author experimented in a preliminary way with pedigreed seeds of *O. biennis* and with seedlings soaked for varying periods in different solutions.

It is stated that up to this time these treatments have on the whole resulted in a reduction of the percentage of germination or in a general weakening of the plants rather than in specifically modifying the germinal constitution, though the desirability of further work is indicated.

On the distribution of abnormalities in the inflorescence of *Spiraea vanhouttei*, J. A. HARRIS (*Amer. Jour. Bot.*, 4 (1917), No. 10, pp. 624-636, pls. 2, figs. 4).—This paper illustrates the chief types of variation noted as occurring in the inflorescence of *S. vanhouttei*, giving the results of studies on the distribution of these abnormalities. It is stated that the distribution of abnormal pedicels among the inflorescences gives a one-sided or skew frequency distribution curve, in which the frequency of occurrence shows a variation opposite in its character to that of the frequency of abnormal pedicels.

Observations on *Betula* in Minnesota with special reference to some natural hybrids, C. O. ROSENDAHL (*Minn. Bot. Studies*, 4 (1916), pt. 4, pp. 443-459, pl. 1, figs. 2).—This includes evidences bearing upon the probable history of some natural *Betula* hybrids, with a key to the different forms discussed.

Studies of the Schweinitz collections of fungi.—I, Sketch of his mycological work; II, Distribution and previous studies of authentic specimens, C. L. SHEAR and N. E. STEVENS (*Mycologia*, 9 (1917), Nos. 4, pp. 191-204, pls. 2; 6, pp. 333-344).—The first of these articles gives a sketch of Schweinitz's mycological work, and the second the distribution and previous studies of authentic Schweinitz specimens.

Taxonomic characters of the genera *Alternaria* and *Macrosporium*, J. A. ELLIOTT (*Amer. Jour. Bot.*, 4 (1917), No. 8, pp. 439-476, pls. 2, figs. 11).—Concluding a study of various members of these two genera, the author gives his views regarding the relationships of different members, the environmental production of differences, and the significance of age and morphology in the description of species.

New species of *Peridermium*, G. G. HEDGECOCK and N. R. HUNT (*Mycologia*, 9 (1917), No. 4, pp. 239-242).—A description is given in this paper of 5 new species of foliicolous *Peridermium* on pine in the eastern portions of the United States, namely, *P. ipomææ* on *Pinus echinata*, *P. palustris*, *P. rigida*, and *P. tæda*; *Peridermium terebinthinaceæ* on *Pinus echinata*, *P. tæda*, also possibly on *P. pungens* and *P. virginiana*; *Peridermium helianthi* on *Pinus virginiana*; *Peridermium fragile* on *Pinus palustris*, *P. tæda*, and *P. rigida*; and *Peridermium minutum* on *Pinus glabra* and *P. tæda*.

Notes on new or rare species of Gasteromycetes, W. H. LONG (*Mycologia*, 9 (1917), No. 5, pp. 271-274).—The author describes, as collected in Texas, the new genera *Geasteroides* and *Arachniopsis*, represented respectively by the new species *G. texensis* and *A. albicans*; *Laternea columnata*; and a form provisionally described as *Lysurus texensis* which it is thought may prove to be only a red form of *Anthurus borealis*.

FIELD CROPS.

Green manure crops in southern California, W. M. MERTZ (*California Sta. Bul.* 292 (1918), pp. 3-31, figs. 7).—This bulletin reports the results of experiments conducted during 1910 to 1915, inclusive, on the relative effect of differ-

ent leguminous and nonleguminous green-manure crops as indicated by the yields of field crops following, notes experiments in progress since 1907 with green-manure crops in a citrus orchard, and presents a general review of experimental and observational data on the subject of green manuring.

Leguminous green-manure crops were grown during the winter in annual rotations with corn, potatoes, cabbage, beets, and sorghum and Sudan grass for hay, and included *Vicia sativa*, *V. atropurpurea*, *V. ervilia*, *Medicago hispida denticulata*, *Pisum arvense*, *Lathyrus tingitanus*, *Melilotus indica*, *Trigonella fenum-græcum*, and *Lens esculenta*. The same nonleguminous green-manure crop (barley, alfalfa, or rye) was grown each year on alternate plats with the leguminous crops. Nitrogenous fertilizers were also applied to certain of the nonlegume plats consisting of from 270 to 1,080 lbs. of nitrate of soda per acre from 1910 to 1913, inclusive, and from 300 to 1,200 lbs. of dried blood per acre during 1914 and 1915. The yields of the leguminous green-manure crops varied from 7.5 tons per acre for *P. arvense* to 20 tons for *V. atropurpurea*, with an average yield for the nine legumes tested of 13 tons as compared with an average yield of 9.7 tons per acre from the eight nonlegume plats. *M. indica* was deemed the most promising of the leguminous crops, while common vetch, bur clover, and Canada peas gave satisfactory results. Rye and barley both gave heavy yields in time for spring plowing.

The field crops grown on the legume plats showed average increases over those grown on the nonlegume plats amounting to 14 bu. of corn per acre, 62 bu. of potatoes, 2.5 tons of cabbage, 6 tons of beets, and 1 ton of sorghum and Sudan grass hay, an average increase for all crops of 37.7 per cent. Applications of nitrogenous fertilizers to nonlegume plats resulted in an average increase in yield of all field crops of 30 per cent, but the value of the increase failed to cover the cost of the fertilizers except with cabbage and potatoes. The nonlegume plat receiving the greatest amount of nitrogen (163 lbs. per acre) showed an average increase of 51 per cent, while the plat sown to *M. indica* showed an increase of 57 per cent.

Observations on the effect of leguminous green manures on citrus trees indicated that the trees on the green manured plats were superior in every way to those on plats similarly fertilized but where no green manure had been used, the results being measured in terms of yield, grade and size of fruit, size of tree, and estimated amount of "mottled leaf." Green manuring resulted in an increase of 68 per cent in total yield, 30 per cent in size of tree, and 63 per cent in desirable sized fruit. Only 3 per cent of the leaves were mottled during the seasons of 1912 to 1914, inclusive, on the leguminous green-manure plats as compared with 13.5 per cent on plats not so treated.

Field methods in growing leguminous green-manure crops are outlined.

Beans in Colorado, A. KEZER (*Colorado Sta. Bul.* 234' (1918), pp. 3-22, figs. 9).—A revision of Bulletin 226 (E. S. R., 37, p. 232).

The effect of hybridization on maturity and yield in corn, T. B. HUTCHERSON and T. K. WOLFE (*Virginia Sta. Tech. Bul.* 18 (1917), pp. 161-170; *Rpts.* 1915-16, pp. 161-170).—This reports the results of experimental work planned to study the effect of hybridization of varieties of corn on maturity and yield in the F_1 generation. In 1915 crosses were made between Reid Yellow Dent and Gold Standard as the pollen parents and Boone County White, Shenandoah County White, and Johnson County White as the seed parents. In 1916 four series were planted with the five parent varieties and the six hybrids, there being four rows of 20 hills each of each variety and hybrid in each series. Daily observations were made from time of tasseling until silking was complete, the time of tasseling and silking obtained for each plant, and the time of maturity for each row. The data are tabulated and discussed.

It was concluded that there was a marked earliness in the time of maturity of some hybrids as compared with their parents while with others the increase was not so marked, although in every case the hybrids matured earlier than their parents when the average time of maturity of the latter was taken as a basis for comparison. An increase in yield in the F_1 hybrids accompanied earlier maturity, this being especially marked in the Johnson County White+Gold Standard cross.

Anomalous seed in Zea mays, T. K. WOLFE (*Virginia Sta. Rpts. 1915-16, pp. 193-199, figs. 2*).—Supplementing his previous observations (E. S. R., 36, p. 335) on two fasciated kernels of maize and their F_1 progeny, the author presents a brief discussion of the F_2 progeny. Pure and hybrid seed produced by each connate kernel in the F_1 generation were planted in alternate rows and allowed to open pollinate. Among the F_2 progeny were kernels with the embryo facing the base of the ear and with the embryo on the left and right side, respectively, although in a majority of the kernels the embryo faced the tip of the ear. Connate seed and two-seeded spikelets also occurred.

A tabular statement is presented showing the number of different kinds of kernels produced by different ears, the data indicating wide variations in the ratio of abnormal to normal kernels. "However, it seems that there is a tendency for connate seed to be inherited. The occurrence of kernels with the embryo placed other than in the normal way is unusually frequent."

The author reports having observed a third connate kernel on an ear borne on Shenandoah County White pollinated with mixed pollen from that variety and Reid Yellow Dent. This kernel failed to show any yellow color and differed from those previously described by him in that there was a partial union of the two kernels occurring at the crowns and along the lower halves of the kernels. They are further described as more or less three-cornered in shape, placed back to back, and as having two embryos but on opposite sides. Two connate kernels were also found on different ears of Silver King and one on an ear of Boone County White.

Summary report on varieties of cotton in 1916, W. E. AYRES (*Arkansas Sta. Circ. 29, pp. 4*).—An abridgement of Bulletin 129 (E. S. R., 37, p. 642).

Fertilizers for Japanese cane, J. M. SCOTT (*Florida Sta. Bul. 144 (1918), pp. 91-98*).—Supplementing work previously noted (E. S. R., 34, p. 831), the results of fertilizer experiments with Japanese cane are reported for 1914, 1915, and 1916.

The highest average yield, 19.8 tons of green material per acre, was obtained from the use of 30 two-horse wagon loads of barnyard manure as compared with a yield of 5.6 tons from untreated checks. The best results with complete fertilizer were obtained with 84 lbs. of sulphate of ammonia, 150 lbs. of acid phosphate, and 60 lbs. of sulphate of potash, with 2,000 lbs. of ground limestone per acre, showing an average yield of 13.7 tons per acre. When only two plant food elements were applied, the best yields were with 84 lbs. of sulphate of ammonia and 60 lbs. of potash per acre, 9.1 tons. Nitrate of soda at the rate of 116.6 lbs. per acre showed the best results for any one single element, a yield of 9 tons. With Thomas slag, acid phosphate, and raw rock phosphate the yields were 6.8, 5.6, and 4.9 tons per acre, respectively, when used singly, although little difference in the values of acid and rock phosphate could be observed when used in complete fertilizers. Applications of 123.5 lbs. of dried blood, 116.6 lbs. of nitrate of soda, and 84 lbs. of sulphate of ammonia per acre resulted in yields of 5.4, 9, and 7.2 tons, respectively. An application of 2,000 lbs. of ground limestone with 84 lbs. of sulphate of ammonia resulted in an average yield of 7.6 tons per acre.

Peanut culture, E. T. BATTEN (*Virginia Sta. Bul. 218 (1918), pp. 3-16, fig. 1*).—This presents a general discussion of field practices and cultural methods recommended for peanut growing in Virginia. It is stated that "the production of this crop may be greatly increased by better cultured methods, good systems of crop rotation, and fertilization." Experimental results are briefly noted which are held to indicate that peanut soils should be limed once in four years with 1,000 lbs. of burnt lime or 2,000 lbs. of ground limestone, and should receive each year from 200 to 400 lbs. of acid phosphate per acre applied in the row at planting time.

In a comparison of Jumbo, Virginia Runner, Virginia Bunch, and Spanish showing the number of nuts per pound, the relative loss in shelling was found to be 33.33, 14.7, 26.92, and 17.74 per cent, respectively. These same varieties grown at Holland during the season of 1917 produced 1,080, 1050, 975, and 675 lbs., of nuts per acre, respectively.

The cost of growing the crop has been estimated to be about \$32.25 per acre and the value of the crop with a yield of 40 bu. per acre to be \$74.80.

Growing sorghum in Kansas, C. C. CUNNINGHAM and R. KENNEY (*Kansas Sta. Bul. 218 (1917), pp. 1-54, figs. 24*).—Approved cultural methods and field practices for growing grain and forage sorghum in Kansas are described, the relative value of sorghums and corn for Kansas conditions discussed, and variety tests with sorghums for grain and forage noted. The sorghums proved to be more resistant than corn to heat and drought and outyielded corn as a forage or silage crop in all parts of the State.

On fertile bottom lands with an annual precipitation of about 30 in., sweet sorghum, Kafir corn, and corn grown for silage showed average yields for a five-year period of 18.02, 11.88, and 11.81 tons per acre, respectively. On infertile soil and in drier parts of the State the respective yields for a three-year period were 12.3, 9.6, and 8.4 tons per acre.

Although sorghum leaves the ground in poor condition for other crops pound for pound of material produced it is said not to deplete soil fertility more than any other crop. Where suitable, late planted crops, such as corn, cowpeas, soy beans, millet, or sweet clover, are recommended for use after sorghum, while in western Kansas fallowing or partial fallowing may be practiced followed by winter wheat.

Varieties of grain sorghum deemed best include Blackhull Kafir for favorable conditions, Pink Kafir for poor soils, unfavorable seasons, or short, late growing periods, and Dwarf milo, feterita, and other early varieties for seasons too short or too dry for Pink Kafir. For forage, Red Amber is said to be specially suited to western Kansas and Kansas Orange and an early strain of Sumac to eastern Kansas.

Of the three planting methods generally employed in the State, surface planting is deemed best for the heavy, poorly drained soils of eastern Kansas, the open furrow method for the well-drained soils of eastern Kansas where rainfall is abundant, and listing for western and central Kansas. Fall listing is regarded as a good farm practice in the western part of the State.

Several feeding experiments reported are abstracted on page 71.

Diseases and insect enemies affecting the crop are briefly described and control measures indicated.

Report of the plant breeder, H. B. COWGILL (*Porto Rico Dept. Agr. Sta. Rpt. 1917, pp. 15-26, 29-36, figs. 6*).—This reports the progress of sugar cane breeding work and of fertilizer experiments with sugar cane conducted at the Porto Rico Insular Station for the year ended June 30, 1917, in continuation of work previously noted (*E. S. R., 37, p. 236*).

The cross pollination of cane varieties was continued employing the method described in the last report, the standard varieties Otaheite and Crystallina again being used as the pistillate parents, and the pollinators being B-347, B-3412, B-109, B-4596, D-117, and D-109. The results are said to have been successful, both from the point of view of technique and as to the number of seedlings produced. Different grades of cloth for bagging the tassels were tested and a closely-woven cheesecloth was found to be most suitable. "The work during the past year tends to verify the belief that some of the characters of cane can be combined by breeding as has been done with other plants. The seedlings from crossed seed appeared to grow stronger and to possess a greater degree of vigor than those from uncrossed seed planted alongside."

Selections were made from the 1912, 1913, 1914, 1915, and 1916 seedlings for propagation and further selection. Brief descriptions are presented of the 10 most promising new varieties developed on the island from selected 1912 seedling canes. Tests of foreign seedlings are also reported in which D-117 and B-3412 are said to have given the best results as compared with Otaheite.

In the fertilizer experiments conducted at the station the limed and fertilized plats produced much higher yields than those similarly fertilized but unlimed. The maximum yield, 24.1 tons, of cane per acre was obtained from a limed plat fertilized at the rate of 120 lbs. of nitrogen, 120 lbs. of potash, and 60 lbs. of phosphoric acid per acre. Cooperative fertilizer experiments are also described in which the highest yields were obtained from an application of 120 lbs. of ammonia, 60 lbs. of phosphoric acid, and 60 lbs. of potash per cuerda (1.01 acres), amounting to approximately 20.15 tons of cane. A tabular statement is presented showing the estimated cost of the various fertilizer treatments and the value of the increase in yield of cane per cuerda. The experiments are said to indicate "that it is economy to use fertilizer, even at the present price, but that the proportion of nitrogen should be relatively high and that of potash relatively low, or entirely omitted."

Effect of some alkali salts upon fire-holding capacity of tobacco, H. R. KRAYBILL (*Bot. Gaz.*, 64 (1917), No. 1, pp. 42-56).—The conflicting theories of Schlosing, Nessler, Garner (*E. S. R.*, 19, p. 334), Mayer, and Barth with respect to the reasons for the favorable action of the potassium salts of organic acids upon the "burning qualities" of tobacco are briefly reviewed. The author then presents and discusses his own experimental data showing the effects of caesium, rubidium, potassium, sodium, and lithium salts in an effort to obtain further light upon these theories. It was suggested that the different salts may affect the colloidal state of the material of the leaf, or that potassium may possess some peculiar chemical properties which account for its behavior.

The method of experimentation involved the treating of tobacco leaves, filter paper, and lump sugar with the various salts and noting their effect upon the fire-holding capacity. The tobacco was all of a strain of a cigar filler type grown in Pennsylvania under definite fertilizer treatments. The leaves had been well sweated. All the salt solutions applied were 28.9 per cent of normal. In studying the effect of the salts upon the colloidal state of the leaf materials some leaves were rendered acid by treatment with 0.5 normal acetic acid and others rendered alkaline by a treatment with 0.2 normal sodium hydroxid. The salts were applied by means of an atomizer and the leaves placed under bell jars to allow a diffusion of the salts through the leaf. Portions of the tip, middle, and base of each leaf were tested for fire-holding capacity, being timed with a stop watch. The author's observations and conclusions may be summarized as follows:

The alkali carbonates of caesium, rubidium, and potassium in the order named showed a definite, marked effect in promoting the fire-holding capacity

of tobacco, while sodium and lithium carbonates did not. Potassium oxalate was the only effective oxalate tested. Of the carbonates and oxalates tested in an alkaline medium lithium was more effective than sodium in the precipitation of colloids and was also slightly more effective in increasing the fire-holding capacity. The citrates showed no such relationship, and of the carbonates potassium, rubidium, and caesium did not behave in this manner. It is doubted, therefore, whether the effect of the salts upon the colloidal state of the tobacco leaf is significant.

Potassium citrate promoted burning, while the citrates of sodium and lithium were nearly neutral in their effect.

The organic salts of potassium, potassium carbonate, tripotassium phosphate, dipotassium phosphate, and potassium sulphate improved the fire-holding capacity, while potassium chlorid, acid potassium sulphate, and monopotassium phosphate were injurious to the burn.

Sodium carbonate improved the fire-holding capacity slightly, while all other sodium salts were either neutral or injurious.

Data were obtained which failed to confirm the theory that reduction of the potassium salts accounted for their favorable action. Other data showed that the harmful effect of the chlorids was not due to their fusion as suggested by Barth. It was also evident that the alternate giving off and taking up of carbon dioxide did not account for the beneficial effect of potassium carbonate.

The author concludes that the effect of the salts in raising the temperature of the leaf may be significant, and that the action of caesium, potassium, and rubidium salts may be due to a number of complex factors. It is also deemed probable that caesium, potassium, and rubidium as carbonates, sulphates, and phosphates possess a specific catalytic action in combustion, and that the chlorids possess a negative catalytic action.

It is proposed to study the rate of decomposition of various organic salts of the alkalis and the decomposition products of various organic substances treated with salts of the alkalis when subjected to temperatures which are attained in the burning cigar.

A brief bibliography is appended.

Shall we plant more spring wheat? W. L. BURLISON (*Illinois Sta. Circ. 214* (1918), pp. 2).—The possibility of increasing spring wheat production in Illinois, especially in the northern and central part of the State, is indicated, and cultural methods are briefly described. Marquis, with 3-year average yields of 32.2 bu. per acre at DeKalb and 24.2 bu. at Urbana, is especially recommended; while Durum, Red Fife, and Bluestem are also regarded as valuable varieties.

Respiration of stored wheat, C. H. BAILEY and A. M. GURJAR (*Jour. Agr. Research* [U. S.], 12 (1918), No. 11, pp. 685-713, figs. 7).—Briefly defining respiration "as the release of energy through the biochemical oxidation of organic compounds as accelerated by certain enzymes," the authors describe rather extensive investigations conducted at the Minnesota Experiment Station on the respiration of stored wheat and on the consequent heating of the grain.

"Since the grain itself is a poor conductor of heat, it follows that the heat energy released through respiration accumulates in the mass in proportion to its bulk, so that the increase in temperature may in time become very marked." All available evidence is held to indicate that the heat of respiration is produced by the oxidation of reducing sugars, that the principal release of energy should occur in the structure where it is required for the synthesis of new organic compounds, and that the embryo being endowed particularly with that function, respiration must be most pronounced in it, if not confined to it.

The procedure followed and the apparatus employed have been described elsewhere, as noted on page 27. The respiration data, stated in terms of milligrams of carbon dioxid respired per 24 hours by each 100 gm. of dry matter, are presented in tabular form, illustrated graphically, and fully discussed. The rate of respiration was studied with relation to various factors, including the moisture content of the grain, the consistency of the wheat kernel, the relative plumpness and soundness of the kernel, the "period of dampness" or duration of exposure to excess moisture in the wheat, the influence of temperature, the influence of accumulated carbon dioxid, and the effect of respiration in an oxygen-free atmosphere.

The results of the investigations are said to support the findings of other workers "that spontaneous heating in damp grain is occasioned by the biological oxidation of dextrose and similar sugars, chiefly in the germ or embryo of the kernel." It was concluded further that moisture is one of the determining factors in respiration, establishing the comparative rate of diffusion between the several kernel structures. Any gain in the moisture content of the kernel increased the rate of diffusion and, simultaneously, the rate of respiration, the increase being gradual and fairly uniform until the moisture exceeded 14.5 per cent, in the case of plump spring wheat, when it was markedly accelerated.

The soft, starchy wheats respired more rapidly than hard, vitreous wheats containing the same percentage of moisture. Plumpness of the wheat kernel affected the rate of respiration, as shown by contrasting plump and shriveled grain. The shriveled wheat respired two to three times as much as did the plump wheat at moisture contents above 14 per cent, while at percentages of moisture below 14 per cent the difference was not very marked. The high acceleration of respiration in shriveled wheat containing more than 14 per cent of moisture was attributed to the higher ratio of germ to endosperm and hence the larger percentage of enzym to substrate as compared with plump wheat.

The period of dampness bore a relation to the rate of respiration, as shown by comparing the respiration of freshly dampened wheat with that of naturally damp grain and with grain that had been dampened and stored for varying lengths of time. The curve of respiration diverged from that of freshly dampened wheat when the moisture content exceeded 12 per cent, and was more marked with 13 per cent of moisture. In the case of wheat dampened and stored, the quantity of carbon dioxid respired varied directly with the number of days the wheat remained in storage. The temperature at which the grain was stored affected the rate of diastatic action, thus increasing the quantity of substrate available to the respiratory enzymes, as indicated by the greater rate of respiration of wheat stored at room temperature than that stored at the outdoor temperature during the winter months.

Unsoundness of wheat caused by the freezing of the unripe plant resulted in higher respiratory activity in the thrashed grain, as was shown by comparing moderately and badly frosted wheats with sound wheat. The frosted wheat respired more vigorously than the sound wheat, this being attributed to the arresting of the synthetic processes on freezing and subsequent activities of the hydrolytic enzymes on thawing of the frozen wheat. The accumulation of glucose as the result of starch hydrolysis furnished larger quantities of substrate to the respiratory enzymes.

Increasing temperatures accelerated the rate of respiration until 55° C. was reached. With rising temperature the diastatic action upon starch increased until a point was reached at which enzym activity diminished. Accumulation of carbon dioxid in the respiration chamber decreased the rate of respiration. The mean rate by four-day intervals was highest for the first four days, diminishing

materially in successive periods. Respiration was reduced in an oxygen-free atmosphere, the ratio to that occurring in a normal atmosphere being about 1:2.5.

A bibliography of 49 titles is appended.

The dandelion in Colorado, B. O. LONGYEAR (*Colorado Sta. Bul. 236 (1918), pp. 3-35, figs. 21*).—The appearance and habit of growth of the dandelion (*Taraxacum officinale*), said to be the most noticeable and persistent weed in lawns in Colorado and also reported as a rather important field weed in native pasture lands below 8,000 feet elevation, are described, and experimental work in an effort to effect its eradication and control is noted and fully discussed.

Germination tests with seed collected the fourth day after the first opening of the blossoms and on each successive day up to and including the ninth day indicated that at least seven days must elapse before any appreciable amount of seed is sufficiently mature to germinate. The maximum germination observed amounted to 25 per cent and the minimum to 8.3 per cent.

Based upon experimental results and upon general observations the following methods, or combination of methods, are deemed adequate for the control of the weed: (1) The establishment of lawns on a well-prepared seed bed and with good seed containing 10 per cent of white clover. Dead spots and thin places on the sod of old lawns should be reseeded each year, preferably in the early spring. (2) The application of about one teaspoonful of gasoline or kerosene to the crown of each plant at any time during the growing season. (3) The digging out of individual plants as deeply as possible and at least once each season, preferably just before blooming. A second digging in the fall is recommended. (4) The prevention of seeding by early digging, the use of gasoline on individual plants, frequent clipping, picking the flower heads while in bloom, and by early spraying with a suitable herbicide. (5) Spraying badly infested lawns with a solution of iron sulphate (1.25 lbs. per gallon) at least three times at intervals of about two weeks preferably in late summer was found to be most effective and was also the cheapest method from the standpoint of labor costs.

The dandelion did not crowd out alfalfa under favorable conditions of growth for the alfalfa, some limiting factor being present wherever an encroachment of the weed was noted.

Johnson grass control, H. C. HEARD (*Arizona Sta. Bul. 82 (1917), pp. 333-355, figs. 11*).—Experimental work on the eradication and control of Johnson grass (*Sorghum halepense*) in the irrigated valleys of southern Arizona, as outlined by J. F. Nicholson, is described, and tabulated data are presented showing the estimated cost and returns from the various treatments from July, 1915, to November, 1917. The experiments were conducted on the Salt River Valley Farm near Mesa, one-half of the tract being described as infested with a perfect stand of Johnson grass and about 40 per cent of the remainder heavily infested. The methods of treatment embraced summer fallow followed by winter grain, summer pasture with sheep followed by winter grain, intensive cultivation employing a rotation of cotton and corn, and continuous dry fallow. The fields varied in size from 10 to 40 acres. The different operations are discussed in detail and conclusions reached as follows:

"The quickest way to rid land of Johnson grass is to overgraze with sheep, meanwhile irrigating frequently. The most effective way, as well as the most economical, is the frequent cultivation of a late summer crop, such as corn, followed by another crop demanding much tillage, such as cotton. The exact crops to be chosen should depend upon the market outlook and the probable price which can be realized. The method demanding the least labor and out-

lay of cash is dry fallow in summer followed by winter grains. This system may be very profitable when grain prices are high."

Seed Reporter (*U. S. Dept. Agr., Seed Rptr.*, 1 (1918), No. 6, pp. 4).—A further report on the war emergency seed survey of January 31 is presented showing the total receipts and stocks on hand for January 31, 1918, and earlier dates, of 33 kinds of vegetable seed and 17 kinds of field seed, including clover, alfalfa, grasses, rape, and corn. The cooperative arrangements made by the Seed Stocks Committee of this Department with the U. S. Food Administration Grain Corporation for supplying spring wheat seed are outlined.

The sweet potato outlook is discussed in detail. Aside from the general shortage of seed sweet potatoes, large quantities of potatoes that were apparently sound are said to have been of doubtful quality and unfit for seed. Tabulated statistics are presented showing the stocks of registered seed of Irish potatoes in eight States inspected by this Department in the bin or storage cellar during 1917 and found to comply with certain requirements as to uniformity in size, trueness to type, relative freedom from varietal mixture, and both external and internal evidences of disease. Additional data show the stocks of seed certified by State organizations in five States.

Brief notes are presented on the velvet bean, navy bean, and sweet sorghum seed situations.

HORTICULTURE.

Report of the horticultural department, C. G. WOODBURY (*Indiana Sta. Rpt. 1917, pp. 41-47*).—The results of the long-continued orchard management investigations, here summarized, have been previously noted (*E. S. R.*, 38, p. 641).

During the past year greenhouse investigations have been conducted in the application of carbon dioxide to soils growing Christmas peppers, head lettuce, radishes, and string beans. As here briefly summarized, carbon dioxide appears to have beneficial as well as detrimental effects. The beneficial effects are that it causes various bacterial activities to be increased and that it increases the water soluble plant food in the soil. Its detrimental effects are that it increases soil acidity and that the amounts used have excluded oxygen to a great extent from the soil atmosphere.

Fertilizer experiments with head lettuce show nitrogen to have given better responses than any other element. The principal observed effects of organic manure as compared with chemicals were that it furnished available nitrogen continuously throughout the time of the investigation.

Experiments with winter or dormant pruning have been conducted since the spring of 1912. The main differences in pruning practice employed on the different plats were a rather severe annual heading back as compared with no heading back. The plats receiving no annual pruning also received a minimum of thinning out consistent with good orchard practice and no cutting was done except in the case of necessity to preserve the form of the tree. The results for the five-year period, as here summarized, show that neither type of training nor severity of pruning has had a material effect on the average tree growth as evidenced by circumference increase. The growth results attending pruning practices appear to be directly influenced by the moisture conditions immediately following. Of the trees on the plats that have borne fruit, lightly pruned trees have produced on an average 83 per cent more fruit, 35 per cent more highly colored fruit, and 15 per cent smaller fruit than heavily pruned trees during the second year of bearing, corroborating the results of the first year.

Another pruning experiment was started at Bedford, Ind., in the spring of 1916, with the view of studying a number of factors not previously considered.

In this experiment the results of the first season showed that system of soil management exerted a greater effect on tree growth than did pruning. Cutting back the annual growth of these young trees proved to be a detriment in every case, either where the trees were in sod or grown under tillage, and there was no pronounced indication that pruning was less injurious under one system than under the other.

In the cover crop experiment being conducted in the station orchard trees on the plat of early sown rye made the best growth during the past season. Trees on the check plats made the poorest growth records, indicating that it is particularly injurious to leave ground bare. The cover crops maintained a uniform and higher soil temperature than the checks. Observations made in the spring indicate that the green covering tends to deplete the moisture content and lower the soil temperature, while the dead covering tend to conserve the moisture and lower the temperature.

Vegetable improvement, H. B. COWGILL (*Porto Rico Dept. Agr. Sta. Rpt. 1917, pp. 27, 28*).—A list is given of northern varieties of vegetables that have succeeded at the station, together with a brief preliminary report on tomato breeding experiments.

The home vegetable garden, M. F. AHEARN (*Kansas Sta. Circ. 64 (1918), pp. 8, figs. 2*).—This circular contains concise suggestions for growing a home supply of vegetables, including plans for the rotation of crops.

Hotbeds for home gardens, W. E. LOMMEL (*Indiana Sta. Circ. 77 (1918), pp. 8, figs. 7*).—This circular discusses the construction, preparation, and management of hotbeds.

The war garden hotbed, C. E. DURST (*Illinois Sta. Circ. 215 (1918), pp. 8, figs. 5*).—This circular contains practical directions for the construction and management of hotbeds and cold frames.

Revised compatability chart of insecticides and fungicides, G. P. GRAY (*California Sta. Circ. 195 (1918), pp. 3, fig. 1*).—The author's compatability chart, which was originally prepared in 1914 (*E. S. R., 31, p. 751*), has been revised to correspond to the best current spraying practice, simplified, and arranged in the form of a circular chart. It indicates the sprays that can be applied in combination, thus reducing the cost of application, and also points out the dangers in apparently harmless combinations.

Directions for spraying fruit trees in Illinois (*Illinois Sta. Circ. 212 (1918), pp. 12, figs. 3*).—This circular is particularly designed to meet the needs of the owners of small orchards. Spray schedules are given for apples, pears, peaches, plums, cherries, currants, gooseberries, and grapes, together with directions for making and mixing the standard sprays.

The Indiana Horticultural Society's experimental orchard, J. OSKAMP (*Indiana Sta. Circ. 74 (1917), pp. 16, figs. 7*).—The purpose of this circular is to record the work carried on in this orchard by the society and to make the conclusions and judgment of J. A. Burton, superintendent, available to the fruit growers of the State. The orchard was started in 1899, largely for variety testing, and was transferred by the society to Purdue University in 1917. The prime purpose of the orchard was to produce new and better varieties of apples. In 1900, 10,000 seeds were planted in nursery rows and more seed was planted in 1905. One thousand seedlings of known parentage resulting from cross-pollinations have also been grown. A few of the best of the seedlings that fruited in the orchard are here noted and in some cases described.

Summing up the results of the work with seedlings it is concluded that there appears to be no way of forecasting the value of the fruit of an apple tree by the habit of growth of the seedling. Varieties from which seeds have been

planted are Grimes, Stayman Winesap, Rome Beauty, Ben Davis, Salome, Kansas Keeper, Mann, and Kentucky Cider Crab. Seventy-five per cent of the resulting seedlings have been fairly good. Winesap gave the largest number of promising seedlings. Seedlings of Winesap generally preserved the poor root system of the parent and those of Ben Davis the good root system of the parent. From all of the seeds planted in the orchard there has never been a reproduction of the original variety even when fertilized by its own pollen. No specific data are given on the cross-pollinated seedlings.

Studies of the influence of stock on scion have indicated that certain stocks do influence the scion and that others do not. In one case, scions of Yellow Transparent and Chenango were grafted on a wild crab, which had been bearing heavy crops of fruit previous to the insertion of the scions. The stock has not influenced the fruit of either variety, but the ungrafted crab limbs have borne no more fruit and the growth of the stock has been restricted to the limbs bearing the scions. The inserted scions have grown rapidly, whereas there has not been a new growth on the crab limbs of half an inch in the last 13 years.

A comparative test of scions taken from nursery stock and from bearing trees resulted in no observable difference in the bearing qualities of the grafts. The same was true of water sprouts used as scions. Likewise, variations in size and color of fruit of the same variety as observed on different trees were nullified when scions from these trees were grafted on the same tree. From these results as a whole it is concluded that the observed variations within varieties are probably due in almost every case to environment rather than to bud variations and that there is little chance of improving apple varieties through bud selection.

In order to test the effects of spray chemicals on tree roots, enough lead arsenate and copper sulphate to spray a full-grown tree for 30 years was spread on the ground, as far as the limbs reached, around a seven-year old Duchess tree. The only immediate effect was to kill some of the grass and weeds under the tree and the tree was still robust and healthy seven years after this drastic treatment.

As far as the soil in this orchard is concerned fertilizer experiments have given neutral results during a 10-year period. An actual test of a carload of soil imported into the orchard from Wenatchee, Wash., indicates that it is something other than soil that causes early bearing in the Pacific Northwest and that soil is not responsible for variations in quality between far western and eastern apples.

The circular concludes with a report on named varieties of apples planted in the experimental orchard in 1899.

Seed production in apples, C. S. CRANDALL (*Illinois Sta. Bul.* 203, *abs.* (1917), pp. 4).—An abstract of Bulletin 203 (E. S. R., 38, p. 245).

Further observations on the effects of pruning, root pruning, ringing, and stripping on the formation of fruit buds on dwarf apple trees, A. W. DRINKARD, JR. (*Virginia Sta. Tech. Bul.* 17 (1917), pp. 137-146, *figs.* 5; *Rpts.* 1915-16, pp. 137-146, *figs.* 5).—This paper gives the results for 1915 and 1916 of experiments started in 1913 to determine the effects of pruning, root pruning, ringing, and stripping at different seasons on the formation of fruit buds on apple trees. A record of the effects which the different operations produced on the fruitfulness of the trees in 1914 is given in a previous paper (E. S. R., 33, p. 735).

The trees received no pruning treatment since 1913, but the results as here presented for 1915 and 1916 continue to show marked effects on fruit

bud formation due to the original treatments. They confirm in general the conclusions drawn in the previous paper, thus indicating that the influence of a particular treatment or operation may extend over a long period of time. The tabular data obtained for the three seasons, 1914-1916, also show the phenomena of alternate-year bearing. The trees which fruited heavily in 1914 produced relatively few fruit buds in 1915 and heavy crops in 1916. Likewise, light-yielding trees in 1914 bore heavily in 1915 and again lightly in 1916. The various treatments given the trees appeared to shift the fruiting year, since the check trees bloomed on the alternate year as compared with the treated trees. During the period of the experiments the check trees have not produced as many fruit buds as the treated trees.

Studies on methods of protecting ringing wounds on apple trees to promote their healing, A. W. DRINKARD, JR., and A. A. INGHAM (*Virginia Sta. Tech. Bul. 17* (1917), pp. 147-160, figs. 8; *Rpts. 1915-16*, pp. 147-160, figs. 8).—The object of this study, which was conducted during the years 1915 and 1916, was to secure data on the healing of wounds made by the operation of ringing. An annular cortical section was removed from the trunks of the experimental trees about 12 in. above the ground, the width of the sections ranging from 0.5 to 1.5 in. on different trees. The first series of experiments was conducted by the senior author in August, 1915, some of the wounds being covered with various protective plasters, and others being left exposed. These experiments were performed too late to produce any material increase in the formation of fruit buds on the treated trees, but they showed clearly the possibility of protecting wounds so that healing might proceed properly. Adhesive plaster, friction tape, paraffin paper, cheesecloth inserted in water, and Scott's tree protectors all proved satisfactory. Covering the wounds with paraffin paper was the simplest and cheapest method of protecting them.

During the season of 1916 the junior author performed a series of experiments to determine the conditions which favor the proper healing of ringing wounds without interfering with the object sought through ringing and the practicability of controlling the factors which influence the proper healing of such wounds. The ringing operation included branches of full-dwarf trees varying in circumference from 3 to 5 in., trunks of full-dwarf trees varying from 7.5 to 11 in. in circumference, and trunks of half-dwarf trees ranging from 11 to 15 in. in circumference. The maximum width of ringing wound used on the smaller trees was 1.5 in., and on the larger trees, 3 in.

These experiments showed that the period of fruit bud differentiation should be the controlling factor in selecting the time to do the ringing. For the station locality this time may vary between May 24 and July 26, or possibly between even wider limits, depending upon seasonal conditions. Complete healing was secured with all widths and circumferences used in the experiment and the width of the ring need not be varied to accommodate different tree circumferences. Equally good healing was secured on fairly vigorous trees and on trees appearing very vigorous. However, ringing is more apt to promote fruit bud formation on very vigorous trees.

Moisture is essential for the proper healing of ringing wounds and may be supplied artificially or conserved by checking evaporation. In this work the use of some form of covering, thus preventing evaporation, gave better results than supplying the wounds with moisture artificially.

In no case did paints and similar preparations that were used promote or permit healing. Disinfectants when used alone were of no value, but when used in conjunction with paraffin-paper protectors perfect healing and protection against fungi and bacteria were secured with certain ones, such as a satur-

Prior to the bending experiments detailed records were made of the characteristics of 1,658 apple shoots (Grimes and Escopus) at the end of the growing season. Seven hundred and eighty-three of these shoots were then artificially bent while still dormant and fastened in new positions. Records were then made at the close of the following growing season as to increase in diameter, amount of new shoot growth, and number of fruit spurs formed. The results of the study are summarized as follows:

"The data show that on the average the total percentage of buds 'breaking' on the artificially bent shoots was practically the same as that on check shoots. Artificial bending did not materially influence the percentage of buds that formed fruit spurs or the percentage that formed new shoots; though in one of the two varieties studied it proved a stimulus to shoot growth rather than a check. The artificial bending resulted in a change in the location or distribution of fruit spurs and of new shoots on the shoots of the preceding season. Its general tendency was to increase the number of fruit spurs toward the terminal end of the shoot and decrease them toward the basal end. Conversely, its general tendency was to decrease the new shoot growth from the terminal portion of the shoot and increase it from its basal portion.

The winter heading back and thinning out of apple shoots in young trees, by V. R. Gardner (pp. 57-78).—This article presents tabular data dealing with the effect of winter heading back of one-year-old shoots upon the subsequent development of spurs and branch shoots from those same shoots; the effect of winter thinning out upon the development of new spurs on adjacent unheaded shoots; the effects of winter heading back and of thinning out upon fruit-bud formation on previously established spurs; and the effects of these two methods of pruning upon the formation of terminal and lateral fruit buds on the new shoots of the following season.

The author's conclusions based on these data are summarized as follows: "A statistical study of 1,055 individual Grimes shoots in young trees upon winter heading back warrants the following statements:

"In general, heading the individual dormant apple shoot decreased the number of new branch shoots to which it gave rise, this decrease in number of new shoots being greater with increase in severity of heading.

"In this variety, heading back, within the range employed (i. e., 0-80 per cent) exerted comparatively little influence upon the amount of new shoot growth to which the individual shoot gave rise. In other words, the amount of new shoot growth to which a shoot will give rise the following year is correlated with the length before pruning rather than with its length after pruning or with the amount or severity of the pruning it may receive. There is reason to believe that in some varieties it acts as a stimulus to shoot growth.

"Heading back resulted in a decrease in number of fruit spurs to which the individual shoot gave rise, the decrease being more marked with increase in the severity of heading. In other words, fruit-spur formation on the individual shoot is correlated with the length of the shoot after, rather than before, pruning.

"Though the new shoot growth produced by headed shoots tended to be closely correlated with the size of the original shoot, rather than with what is left of the shoot after heading, the data show that comparatively severe heading tended to subordinate its relative position in the tree. The effects of continued severe heading are cumulative, and consequently it is comparatively easy to check or make more important one part of the tree that is growing too rapidly or too slowly.

"A statistical study of the comparative effects of winter heading back and of thinning out in 461 young apple trees, including trees of Grimes, Gano, Rome, and Esopus, warrants the following statements:

"Broadly speaking, a general heading-back of the shoots of a tree acted as a stimulus to new shoot growth, resulting in an increase in number of units of new shoot growth for each unit of old, as compared with unpruned trees. The amount of this stimulus varied considerably with variety. On the other hand, an equally severe thinning acted as a check to new shoot growth, resulting in a decrease in number of units of new shoot growth for each unit of old, as compared with unpruned trees. The amount of this check varied considerably with variety.

"Lessened fruit-spur formation accompanied winter shoot pruning of any kind—either thinning out or heading back. In the case of profuse spur-bearing varieties, like Esopus and Grimes, heading-back resulted in a much more marked check to fruit-spur formation than equally severe thinning out. This was not so true with those varieties like Gano and Rome that when young bear a larger percentage of their fruit buds laterally upon shoots.

"The comparative effects of thinning out and of heading back upon fruit-bud formation varied considerably with the variety. In general, it was found that thinning led to an increased production of fruit buds upon spurs, as compared with equally severe heading. On the other hand, heading generally led to an increased production of fruit buds terminally upon shoots. In some varieties, thinning was accompanied by a greater production of lateral fruit buds on shoots than equally severe heading; in other varieties the reverse was the case. Considering the comparative effects of thinning out and of heading back, not only upon fruit-bud formation, but upon fruit-bud removal as well, it is evident that the continuation of the former practice tends to increase flower and fruit production, while the latter tends to decrease those functions.

"There was little difference between the effects upon increase in trunk circumference of winter heading back and winter thinning out."

Orchard heating, F. L. WEST and N. E. EDLERSSEN (*Utah Sta. Bul. 161 (1917), pp. 3-48, figs. 2*).—This bulletin reports the results of orchard heating experiments conducted at the station, cites some of the results secured by other investigators, discusses the conditions under which artificial heating would be financially profitable, and describes the most approved method of carrying out the work. A list of cited literature is appended.

Among the experiments conducted by the authors, water at a temperature of 55° F. was piped under 50 lbs. pressure to the top of each of the trees in an acre of apricots. The water left the pipes as a fine spray to a distance just sufficient to cover very thoroughly the entire tree. With the spray on two nights, the treated section was found to be 0.5° colder than the air outside and was the same both nights. The spray was left on until noon each day. Although the air was warming up the mean temperature underneath the cloud was one morning 1.1° colder than the adjoining section and the other morning 2.5° colder; showing that the cloud of spray slightly retarded the warming effect of the sun. When the spray was applied on a night when frost occurred, the sediment in the water clogged the fine spray, and the coarse spray, even though the water was warm before leaving the pipes, collected in the fruit buds and froze them; producing the same effect as a storm of sleet.

An experiment was conducted at the station in the spring of 1910 under the direction of W. H. Homer, jr., in which carbon dioxide was employed as a smudge without the addition of heat. Ninety-six lbs. of carbon dioxide was

liberated in one acre of an orchard during the night in a period of $2\frac{1}{2}$ hours. The gas not only failed to keep the treated area warmer than the adjoining section but actually cooled it slightly.

In later experiments conducted by the authors the relative merits of heat and smudge were tested under controlled conditions; the heat being supplied by means of electric heaters, the construction of which is here briefly described. Electric heaters were placed in the bottom of an approximately airtight box, 2.5 by 4.5 ft. and $7\frac{1}{4}$ ft. deep, and they gave a rise in temperature of 14.1° . With 22 lbs. of carbon dioxid (three times the volume of the box) which had been warmed to the same temperature as the box before it entered, the heaters gave a rise of only 2.8° more than with no smudge, the gas being liberated in 50 minutes. A test of the air inside of the box showed 3 per cent carbon dioxid there. This result was duplicated on a larger scale by heating (with electric heaters) an area of 500 sq. ft. surrounded by walls, thus indicating that a smudge of carbon dioxid is practically of no value in confining heat arising from orchard heaters.

In order to determine the amount of heat required to warm air, electric heaters were distributed about in the open in the same manner as smudge pots are distributed in the orchard. The heaters were not placed in an orchard because electric power was not available there. As a result of six experiments 100 horsepower of electrical energy when converted into heat in the open air gave a temperature rise of 20° , the temperature outside being 70° . It required approximately 14 watts per square foot to obtain 1° rise in temperature. The results of 15 investigations of other stations show that with 100 heaters to an acre the orchard will remain about 4° warmer than the surrounding unheated area. Winds of 10 miles an hour reduce this to less than 1.5° . Assuming that the common smudge oils give out 18,800 B. t. u. of heat per pound burned and that a gallon of this oil lasts 4 hours, the authors figure that these smudge pots develop approximately 6 watts per square foot in raising the temperature of the air in the orchard 1° .

The authors' investigations on hardiness of fruit buds to frost (E. S. R., 37, p. 344), some data on which are here given, indicate that fruit buds are less sensitive to cold than is commonly believed; hence there is a tendency to start orchard heaters too soon and too often. The equipment necessary, and the best method of orchard heating, the forecasting of frost, and the cooperation of the Weather Bureau, are given with considerable detail. The average dates of the blooming period of apples and peaches in the five leading horticultural counties of Utah are given, together with data showing the number of nights each year that heating would have been necessary in the past 16 years.

A careful study of the data on fruit yields, selling price, and frost damage shows that by the most economical heating the value of the fruit saved is approximately equal to the cost of saving it. Mathematical equations are worked out, graphed, and explained, showing under what conditions artificial heating would be financially profitable. Summing up this discussion the authors conclude that "to increase one's profits or decrease his losses by heating, the sale price of the fruit must be high, the fuel must be cheap, the frost must not be accompanied by winds, and the heating must be carried out according to the most modern methods with military precision. It is very doubtful whether it pays in Utah."

Intercropping of young irrigated orchards, R. S. VAILE (*California Sta. Circ. 194 (1918)*, pp. 11).—This circular presents the results of a survey conducted during 1917 to determine the extent to which young orchards were being utilized for growing secondary crops.

The data secured indicate that at least 45 per cent of the young orchards were intercropped in 1917 as compared with only about 25 per cent under normal conditions. Some data are given showing the financial returns secured in some of these orchards, together with the results from intercropping 60 acres of citrus orchard at the Citrus Experiment Station with black-eye beans in 1917. Under the existing high prices the black-eye beans yielded a net profit of \$30.46 per orchard acre (0.75 acre) or \$40.64 per full acre. Suggestions are given relative to the selection and management of intercrops in young orchards.

Report of the cranberry substation for 1916, H. J. FRANKLIN (*Massachusetts Sta. Bul. 180 (1917), pp. 183-234*).—The substation work during 1916 was mainly along the lines reported for 1915 (E. S. R., 36, p. 43).

Some work in blueberry culture was started with the view of determining the feasibility of utilizing bogs unsuited to cranberry culture. A number of selected and bred strains provided by the U. S. Department of Agriculture, together with selected wild plants, are to be tested.

Weather observations were made as in previous years. A prolonged wet season caused a large proportion of the blossoms to fail to set fruit and small fruit was seriously damaged by flooding. In the author's opinion the late holding of winter flowage throws the blossoming period out of its normal season and enhances the danger of its meeting unfavorable conditions for the setting of fruit.

Further experiments with shade tobacco cloth as a means of frost protection indicate that two thicknesses of the cloth spread on the vines will probably afford most of the Cape bogs sufficient protection. However, this method of protection is expensive and is not satisfactory on bogs with much moss under the vines, because of the reduced radiation on such bogs. Water is a better medium of protection if it can be applied at reasonable expense. The results of these investigations show that for bogs in warm or average locations that are flooded by pumping it is unprofitable in the long run to try to protect well-colored berries from frost, especially if the crop is light. Ripened Early Black or Howes cranberries are not injured from exposure to 23° F. and sample lots submitted to a temperature of 9° only showed about 50 per cent frosted fruit. No temperatures low enough to harm well-colored berries occurred at the station bog in any picking season from 1911 to 1916, inclusive.

Storage tests to determine factors influencing the keeping quality of cranberries were continued. The results are presented in tabular form. They indicate that cranberries should not be picked wet. Scoop picking is not particularly harmful to keeping quality, but deep scoop picking causes a maximum amount of under berries, loose leaves, and sand to be gathered, these materials being harmful in storage. Cranberries exposed to the sun on the bog for several hours after picking seemed to keep about as well as those housed at once under average storage-house conditions. It is suggested, however, that berries exposed to the sun might not keep as well as berries quickly cooled after picking and placed under cold-storage conditions. Lack of sufficient ventilation affects cranberry keeping adversely, apparently by interfering with the processes of respiration, thus permitting the accumulation of carbon dioxide gas given off by their tissues and at the same time reducing their supply of oxygen. Relative to storage previous to shipment it is concluded that low temperatures, because of their retarding effect on the processes of respiration and on the growth of rot-producing fungi, seem most important. The berries should be carefully graded and handled in packing and the containers should be small and well ventilated.

The year's experience with resanding plats is presented in tabular form and compared with previous results. The yield and relative keeping quality of berries grown on different fertilizer plats in 1916 are also given.

The fruit of the fertilized areas was as a rule much inferior in both quantity and keeping quality to that of the checks, this being especially marked with the plats treated with lime and with the maximum amount of nitrate of soda. Summing up the results of the fertilizer work since it was started in 1911 the author concludes that in general whatever slight advantage in yield has been gained by the use of the fertilizers has been balanced by the cost of the treatment, the deterioration in the quality of the fruit, and the greater cost of picking due to the increased vine growth.

The season's work with plant diseases and insects is noted on pages 55 and 60.

Sterility in the strawberry, W. D. VALLEAG (*Jour. Agr. Research* [U. S.], 12 (1918), No. 10, pp. 613-670, pls. 6, figs. 4).—This paper reports studies on the sex condition in strawberries (*Fragaria* spp.), which have been carried on at the Minnesota Experiment Station during the past four years. The primary object of the investigation was to determine some satisfactory explanation for the phenomenon of pollen abortion which is so prevalent among heterozygous plants or plants of hybrid origin. The study of pistil sterility and anther abortion in the cultivated varieties and wild species, which are the result of a strong tendency of this genus toward dioeciousness, also received considerable attention. The results of the studies are presented in a series of tables, illustrated by a number of plates, and fully discussed. A bibliography of cited literature is given.

Summing up the investigations as a whole the author arrived at the following conclusions: "The flowers of *Fragaria* are pentamerous with regard to all parts except pistils. The stamens are arranged in three whorls; the outer parapatalous series of 10 stamens, the middle antipetalous, short filamented series of five, and the inner antisepalous series of five. Increases in stamen number are due to the addition of five, or a multiple of it, to either the antipetalous or the antisepalous series. Decreases in stamen number are due to the loss of first the antipetalous and next the antisepalous series. Apparently the parapatalous series is permanent. Decrease in stamen number is in no way related to dioeciousness. There is a positive correlation between flower position, flower part number, and size of fruit in the strawberry.

"The wild American species of strawberry, from which the cultivated varieties have been derived, are for the most part dioecious. The pistillate plants bear staminodia, which rarely develop as far as the pollen mother cell stage, and the staminate plants bear pistils which superficially appear to be perfect but which are only occasionally functional. In a few wild clones of *F. virginiana*, which appear to be sterile, pollen development is carried as far as the tetrad division or slightly beyond this to the liberation of the microspores, when complete disintegration of the anther contents to an oily mass takes place. In other instances a portion of the microspores develop normally while the remainder within the same anther disintegrate, while in other clones shortly after liberation, and following a slight growth of the microspores, complete abortion of the same type as that found in hybrids takes place. These anther types, in wild clones, all appear to be various expressions of a tendency toward dioeciousness and are not the result of hybridization. Similar anther types are common in certain cultivated varieties, on the early flowers of an inflorescence, and especially on those appearing early in the season.

"There is a correlation between flower position and fertility of pistils, fertility decreasing in the later flowers of an inflorescence. Pistil sterility is expressed in the production of irregularly shaped berries or entirely sterile flowers.

Sterility of the later flowers of an inflorescence is more general in hermaphrodites than in pistillates, suggesting that the hermaphrodites have been derived from staminate of the dioecious wild forms.

"The appearance of considerable amounts of aborted pollen in wild plants of *F. virginiana* and *F. americana* is rare except in anthers of the intermediate type. Most cultivated varieties produce considerable amounts of aborted pollen of the type common in hybrids. The percentage of aborted grains is not constant in the individual flowers of a variety and neither is it constant in the individual anthers of a single flower, as just as great variations appear within the anthers of a flower as are shown by composite pollen samples of individual flowers.

"In those varieties producing high percentages of aborted grains a portion, at least, of the morphologically normal pollen grains are functional as shown by germination and bagging tests. There is no evidence of physiological self-sterility in the strawberry. In the partially sterile variety Minnesota 3 pollen development is carried on normally up to the liberation of the microspores from the tetrad. At this time all of the microspores appear normal and alike. Following liberation, variations in rate of growth, time of division of the microspore nucleus, and ability of the individual microspores to develop normally are shown. At all stages during the growth period microspores were found in various stages of abortion. *F. virginiana* exhibits as great regularity during this growth period as is shown in the stages leading up to liberation of the microspores.

"Liberation of the microspores from the tetrad marks the beginning of an independent gametophytic generation, so far as the metabolic processes of growth are concerned. The individual microspores float in a homogeneous nourishing medium provided by the sporophyte, but the use of this food material in cell metabolism depends entirely upon the individual organization of the microspores.

"Specific chromosome combinations have been shown by various investigators to be a potent factor in the development or lack of development of individual plants or animals. In plants heterozygous for a number of factors, as are the varieties of strawberries, numerous new chromosome combinations occur for the first time in the microspores. The varying rates of growth, time of microspore division, ability to increase the cytoplasm, and inability in many cases to develop normally seem to be the outward expression of the differential ability of these new chromosome combinations to carry on cell metabolism."

Growing and marketing of grapes, R. T. REM (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 5 (1918), No. 12, pp. 174-177).—Popular instructions for growing and marketing grapes, based largely on the author's experience in a grape vineyard in western Washington.

Report of the chemist (*Porto Rico Dept. Agr. Sta. Rpt. 1917*, pp. 123-131).—This consists mainly of a progress report on an experiment undertaken with grapefruit to determine the relation of the various factors of soil, fertilizer, etc., to the process of ripening. Analyses of fruit from selected trees and picked at different dates are here recorded, together with analyses of soil from some of the test groves. No conclusions have been drawn from the data thus far secured.

Determinations of the ratio between the soluble solids and the acid content of citrus fruits have shown that there is practically no difference in the ratio of solids and acids between fruit held in the laboratory and those sweated. There was apparently a slight increase in the ratio in fruits held from one to three weeks. Much of the fruit from early bloom gave a satisfactory ratio by the middle of October.

FORESTRY.

Manual of forestry for the northeastern United States, R. C. HAWLEY and A. F. HAWES (*New York: John Wiley & Sons, Inc., 1918, pp. XII+281, figs. 65*).—This is a revision of part 1 of Forestry in New England, which formerly appeared as one volume (*E. S. R.*, 27, p. 646). Volume 2 of the revised edition will be entitled *New England Forests and Their Management*. Although written with special reference to New England the authors state that the book is directly applicable to northeastern United States and southeastern Canada.

Report of the Maryland State Board of Forestry for 1916 and 1917, F. W. BESLEY ET AL. (*Rpt. Md. Bd. Forestry, 1916-17, pp. 86, pls. 8*).—A report on various activities during 1916 and 1917, including assistance to owners of woodlands, forest fire protection, war work, educational and investigational work, operations on the State forest reserves and nursery, recommendations for 1919 and 1920, and a financial statement. Appended to the report is information relative to the Maryland Forestry Association, protection and use of State lands, trees available for planting at the State nursery, the white-pine blister disease, and forest fires in 1916 and 1917.

Annual report of the department of forestry for the year ended June 30, 1916, R. DALRYMPLE HAY (*Rpt. Forestry Dept. N. S. Wales, 1916, pp. 17, pls. 4*).—This is the usual progress report (*E. S. R.*, 34, p. 838).

Report of the forestry commission for the year ended June 30, 1917, R. DALRYMPLE HAY ET AL. (*Rpt. Forestry Com. N. S. Wales, 1917, pp. 20*).—This report first outlines the policy of the forestry commission created under legislation in 1916, and cites the steps taken during the period of this report toward the inauguration of the new administration in conformity with the forest policy. Information is then given on the administration of the forests, forest areas, State forest organization, forest fires, silviculture, revenues and expenditures, imports and exports of timber, etc.

The need of a transformation in our afforestation methods in the mountains, F. FANKHAUSER (*Schweiz. Ztschr. Forstw.*, 69 (1918), Nos. 1, pp. 1-7, pl. 1; 2, pp. 25-34, pl. 1, figs. 4).—A discussion of various factors involved in the afforestation of mountain regions in Switzerland, including suggestions for improving methods now employed.

Concerning site, C. G. BATES (*Jour. Forestry*, 16 (1918), No. 4, pp. 383-388).—The author is of the opinion that the Forest Service of the U. S. Department of Agriculture and other agencies now possess abundant data on the growth and increment of all the more important American species of trees, so that the range of productiveness of each species could quite certainly be determined and uniform standards of site quality could be fixed. A standard plan for classifying sites by quality of production is here presented and discussed.

Notes on North American trees.—I, *Quercus*, C. S. SARGENT (*Bot. Gaz.*, 65 (1918), No. 5, pp. 423-459).—This is the first of a series of contributions comprising notes on the distribution and characteristics of North American trees. Some 28 species and 34 varieties of oaks are considered in the present article.

Distinguishing characters of North American sycamore woods, W. D. BRUSH (*Bot. Gaz.*, 64 (1917), No. 6, pp. 480-496, pls. 7, figs. 3).—A study of native North American sycamores with reference to the gross and minute structure of the woods and individual characteristics of the species.

Aspen reproduction in relation to management, F. S. BAKER (*Jour. Forestry*, 16 (1918), No. 4, pp. 389-398).—This paper presents results secured in studies of aspen reproduction by seed and vegetative reproduction as conducted at the Utah Forest Experiment Station, Ephraim, Utah. These studies show that reproduction by root suckers is practically the only means by which

aspen stands are regenerated in that region; hence the management of these stands is simple and reproduction certain, with adequate protection from sheep grazing.

Agency of fire in propagation of longleaf pines, E. F. ANDREWS (*Bot Gaz.*, 64 (1917), No. 6, pp. 470-508, figs. 5).—A discussion of this subject based on observations of natural reproduction following fire in Floyd County, Ga.

The effect of planting method upon growth of western yellow pine, H. C. TURNER (*Jour. Forestry*, 16 (1918), No. 4, pp. 399-403).—The author presents same data based on planting experiments conducted at the Fort Bayard nursery, New Mexico, to show that any distortion that is imparted to the roots at the time of planting is retained for an indefinite period and that this distortion affects adversely the tree's future growth. Spreading the roots of the tree seedlings over the surface of a cone of earth in the center of the planting hole has given the best results from the standpoint of root development and height growth, but probably does not warrant the additional expense involved over the method of planting in the center of holes wide enough to permit the roots to be spread out fairly well in different directions.

Correlation of the strength and durability of southern pine, S. M. ZELLER (*Ann. Missouri Bot. Gard.*, 5 (1918), No. 2, pp. 109-118, pls. 5).—In a recent paper the author reported results of experiments in which some important physical properties of southern pine woods were correlated with the decay induced by *Lenzites sapinaria* (E. S. R., 37, p. 727). This paper gives the results of studies made on the resistance to decay of timbers which had actually been tested for strength.

Briefly summarized the author concludes that "whether we are dealing with shortleaf pine or longleaf pine the stronger pieces of heartwood are the more durable, and vice versa. This, however, does not apply to sapwood, as it seems to decay irrespective of the amount of summer wood and specific gravity, which materially influence the strength of yellow-pine sapwood."

Tapping experiment at New Lunderston Estate, F. G. SPRING and B. BUNTING (*Agr. Bul. Fed. Malay States*, 6 (1918), No. 4, pp. 188-194).—This experiment which was conducted at Banting, Federated Malay States, was arranged to show the respective yields from tapping rubber trees on one-quarter, one-third, and one-half the circumference. The trees were tapped daily by a single oblique cut to the left at a height of 14 in. from the ground. The results for the period, 19.5 months, indicate a considerable advantage in favor of tapping on one-half the circumference, both as to yield and cost of tapping.

A bibliography of recent literature dealing with plantation rubber, A. A. L. RUTGERS (*Arch. Rubbercult. Nederland. Indië*, 1 (1917), No. 6, pp. VI+455-547).—The literature is classified by subjects and also by authors, and a brief résumé is given of the contents of each article. The principal subject headings are cultivation, preparation, diseases and pests, rubber in different countries, addresses, reports, miscellaneous, and periodicals.

DISEASES OF PLANTS.

Report of the botanical department, H. S. JACKSON (*Indiana Sta. Rpt. 1917*, pp. 22-24).—A brief report is given of the activities of the botanist and members of the botanical staff, the investigations including studies of rusts, wheat diseases, tomato diseases, and cucumber diseases.

The work with tomato diseases has been largely done by G. A. Osner, associate botanist, and particular attention was given to the streak blight of tomatoes. This disease is said to be characterized by the appearance of black

streaks on the stems and petioles and dark sunken spots on the leaves. Repeated attempts to isolate an organism from diseased tissues have yielded negative results in every case. Infection is readily secured by inoculation either with or without injury, using extracted juices from diseased plants. Attempts to transmit the disease through pollen from diseased plants have given negative results. It is believed that the causal agent may overwinter in the old stems and gain entrance to the young plants through the roots.

The associate botanist continued his study of the new leaf spot of cucumber previously noted (E. S. R., 37, p. 840). The organism causing this leaf spot has been noted as an undescribed species of *Stemphylium*.

In cooperation with the U. S. Department of Agriculture, a plant disease survey is being conducted, some of the more important new diseases observed in the State being *Illosporium* leaf spot of apple; bacteriosis of beans; *Cercospora* and *Macrosporium* leaf spots of carrot; *Amerosporium* leaf spot of cowpea; *Cercospora* leaf spot of cucumber, muskmelon, and squash; white rust of salsify; and ergot of timothy and orchard grass.

Minor diseases and notes, J. A. STEVENSON (*Porto Rico Dept. Agr. Sta. Rpt. 1917*, pp. 88-98).—Minor diseases of plants are reported, and a leaf spot of the corozo palm due to *Cercospora acrocomia* n. sp. and a pink scale fungus (*Tubercularia coccicola* n. sp.) are described.

Plant diseases in Virginia in 1915 and 1916, F. D. FROMME (*Virginia Sta. Rpts. 1915-16*, pp. 187-192, figs. 5).—This report includes information regarding attacks of stem crack (*Rhizoctonia solani*) at the soil line of bean plants; downy mildew (*Phytophthora phaseoli*) on lima beans; root knot (nematodes) on beet, parsnip, and salsify; blackleg (*Phoma oleracea*) of cabbage; sclerotium wilt (*Sclerotinia trifoliorum*) on crimson clover; anthracnose (*Glomerella gossypii*) on cotton; wilt (*Fusarium vasinfectum*) on cowpea; Pestalozzia rot (*P. uvicola*) of grape; wilt (*Fusarium* sp.) on peanut; and wilt (*F. lycopersici*) on tomato.

Lessons from the rust epidemic of 1916, J. BRACKEN (*Saskatchewan Dept. Agr. Bul. 50 (1917)*, pp. 16, figs. 54).—This bulletin indicates the practices that were found to result in the most satisfactory yields in the investigation field at Saskatoon during 1916, when rust proved to be a factor causing serious loss. These practices include employment of early varieties or early seeding, a medium type of loam soil, cultural treatments prompting early maturity, a medium to thick stand, use of rust resistant varieties, and destruction of alternate hosts of the fungi which cause cereal rusts.

Vegetable diseases, J. A. STEVENSON and R. C. ROSE (*Porto Rico Dept. Agr. Sta. Rpt. 1917*, pp. 83-88).—Notes are given on a number of the more common diseases observed to attack vegetables in Porto Rico, with suggestions for their control, so far as definite means are known.

Some common diseases of vegetables, J. B. DEMAREE (*Ann. Rpt. State Ent. Ind., 9 (1915-16)*, pp. 77-90, figs. 9).—This deals very briefly with diseases and remedies therefor as relating to asparagus, bean, beet, cabbage, celery, cucumber, eggplant, lettuce, melon, onion, pea, potato, sweet potato, and tomato.

Diseases of beans, W. G. SACKETT (*Colorado Sta. Bul. 234 (1918)*, pp. 23-32, figs. 6).—This is part of a revision of Bulletin 226 (E. S. R., 37, p. 248).

Orobanche on bean, S. JOVINO (*Staz. Sper. Agr. Ital., 49 (1916)*, No. 9-10, pp. 514-529).—It is stated that Orobanche is one of the chief local causes of loss in connection with the production of beans. This is due largely to the number of varieties attacked by it and to the smallness and number of its seeds. An account of experimentation with *Helminthia (Picris) echioides* concludes with the statement that the germination of the seeds of Orobanche, which ordinarily requires a long previous rest and then proceeds slowly, may be hastened in the

neighborhood of Helminthia, so that this may be employed as a sort of trap plant for the control of Orobanche.

A study of *Rhizoctonia violacea*, H. A. A. VAN DER LEK (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch.* [Wageningen], 12 (1917), No. 2, pp. 49-130, pls. 9).—The author gives an account (also his abridgment thereof in French) regarding studies carried out with *R. violacea* since its appearance on carrots in 1915 near Wageningen.

Rust of castor bean, G. ARNAUD (*Bul. Soc. Path. Veg. France*, 4 (1917), No. 1, pp. 37-39).—Leaf rust (*Uredo ricini*) of *Ricinus* is reported to have been observed in 1917 at Rabat, Morocco.

A new disease of lupines, B. PEYRONEL (*Staz. Sper. Agr. Ital.*, 49 (1916), No. 11, pp. 583-596, pls. 5, figs. 5).—A descriptive account is given of a root and stem disease of lupines said to be new, and of an associated fungus which is technically described as a new genus and species, *Chalaropsis thielavioides*.

Potato seed diseases and their treatment, L. E. MELCHERS (*Kansas Sta. Circ.* 63 (1918), pp. 2).—The potato crop of Kansas is said to have suffered losses during 1917 ranging from 1 to 25 per cent on account of blackleg, black scurf (*Rhizoctonia* sp.), dry rot or wilt, and scab. These diseases are briefly discussed as to their control. Corrosive sublimate is preferred to formaldehyde as a preventive treatment for potato tubers in this State.

Potato diseases, D. C. BABCOCK (*Ohio Sta. Bul.* 319 (1917), pp. 121-136, figs. 10).—This bulletin discusses the principal potato diseases in Ohio under three heads according to the means of control, namely, selecting clean seed (dry rot, or Fusarium wilt, blackleg, and leaf roll); treating the seed tubers (scab and *Rhizoctonia*); and spraying (late blight, early blight, and tipburn).

The "mottling" disease of cane, J. A. STEVENSON (*Porto Rico Dept. Agr. Sta. Rpt.* 1917, pp. 40-78).—A detailed account is given of an investigation on a disease of sugar cane, a preliminary account of which has already been noted (*E. S. R.*, 38, p. 150). After a careful study of the trouble, the author has decided to call it the mottling disease of cane from its most conspicuous character.

The symptoms of the disease are said to be mottling of the leaves with no other observable change in the canes at first, followed, generally in the first or second ratoons, by a dwarfing of the plant, the presence of cankers or lesions on the stalks, and a decrease in the amount of juice. While no variety has been found resistant, yet, there is considerable variation in the amount of disease present in the different varieties, and this is thought to offer some hope of combating the trouble. Thus far, no definite cause has been found for the disease, although from field experiments it seems to be readily transmitted.

In the previous report, recommendations were made for the control of the disease, but subsequent investigations have shown that none of the measures so far tested is successful. The author recommends that where fields have become badly infected they should not be replanted to cane for at least a year, preferably longer, but should be used for pasture or for other crops. Diseased seed cane, as well as seed material from badly infected fields, should be avoided, and where the disease has not gained great headway, every effort should be made to produce a healthy crop by plowing, fertilization, cultivation, etc.

Brief notes are given on some minor diseases of sugar cane, particularly a brown rot due to *Diplodia cacaoicola*.

Studies of the etiology and control of blister canker on apple trees, J. R. COOPER (*Nebraska Sta. Research Bul.* 12 (1917), pp. 117, figs. 25).—The author gives an account of a study on blister canker of apple (*Nummularia discreta*). This disease, since its recognition as a destructive parasite of apple reported by Hasselbring (*E. S. R.*, 14, p. 160), has become the most serious disease of apple

trees in the United States, the fungus occurring in all of the fruit-growing regions east of the Rocky Mountains and practically every orchard in the State of Nebraska being more or less infected.

The symptoms vary, being affected by variety, age of trees, available water and soil nutrients, and general weather conditions. They may resemble those accompanying sun scald, winter injury, collar rot, and the so-called arsenical poisoning. The organism is a wound parasite attacking either roots or branches, and it may be present for several seasons before becoming visible externally. It is disseminated by means of infected wood, conidia, or ascospores, both of these reproductive bodies being produced throughout the growing season under favorable weather conditions. Conidia usually appear during the season in which the canker first appears, ascospores one or more seasons later, and both may be borne on the same stromata for many seasons thereafter. Ascospores are much more viable than are conidia, but the latter are also important agents in the spread of the disease.

Infection occurs rarely in case of rapidly growing tissues, but readily in case of inactive xylem tissues. The cellular structure is not destroyed, as the fungus penetrates by way of the pits in the cell walls, making more rapid progress longitudinally through the tracheæ than transversely, though the medullary rays facilitate the advance in a radial direction. The characteristic brown discoloration is always associated with the presence of the hyphæ, though sometimes extending some distance beyond their advance. The fungus usually grows faster below than above the point of entrance, if that be aboveground. If inoculated below the surface of the ground, the reverse is true. Susceptibility depends largely upon variety, the vigor of the tree, the available supply of water and of nutrient solutes, and the season in which inoculation occurs, being less in early spring and summer during rapid growth. Fertilizing experiments have shown little or no benefit. Variation in resistance may be due to chemical as well as to anatomical and physiological factors.

It is thought that control must depend upon prevention, as cures of trees once affected are possible in very few cases. Heavy pruning aggravates the disease. Either copper sulphate or lime sulphur applied to the cankers is effective. All wounds should be covered. Liquid asphaltum appears to be about as effective as white lead and oil for this purpose. The first coat should be thin, the second heavier.

Methods of controlling blister canker, J. R. COOPER (*Nebraska Sta. Bul.* 161 (1917), pp. 18, figs. 8).—This is a popular edition of the bulletin noted above.

Apple or cedar rust, R. C. WALTON (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 3, pp. 86-88, figs. 3).—It is stated that of the Ohio counties reporting apple rust 91.3 per cent are in the southern half of the State where the red cedar is more abundant as a native tree, though both this tree and the disease exist more or less in all parts of the State. In some apple varieties, as Rome Beauty, infection of the fruit is frequently severe in addition to the leaf infection. Winesap, Stayman Winesap, and Maiden Blush are named as resistant, Ben Davis and Grimes Golden as moderately so. The best method of control is destruction of all cedars within one mile of the orchards.

Dusting for cedar rust, F. D. FROMME and H. E. THOMAS (*Virginia Sta. Rpts.* 1915-16, pp. 179-183, figs. 2).—Having used successfully a dusting mixture containing copper for late blight of tomato (*E. S. R.*, 36, p. 750), the authors tested this plan, employing a dust mixture containing sulphur, hydrated lime, and lead arsenate in the ratio of 15:5:4, for cedar rust (*Gymnosporangium juniperi-virginianæ*), on apple trees adjacent to cedars. Treatments were applied either before each important rain, after such rains, or on the regular spray schedule.

No constant decrease of infection could be found on any of the plats receiving dust applications.

Control of cherry leaf spot in Wisconsin. G. W. KEITT (*Wisconsin Sta. Bul.* 286 (1918), pp. 11, figs. 8).—This is a report based on work done by the author during two seasons with cherry leaf spot (said to be the most serious fungus disease of cherry in Wisconsin) in the attempt to ascertain the times and numbers of sprayings which would give the best and most economical results under present conditions as regards prices of labor and materials.

The most obvious feature of the disease is the loss of the leaves, resulting in a lowering of vitality and failure of the fruit to attain its normal growth and maturity. The disease also affects the fruit and fruit stems. The causal fungus overwinters in dead leaves on the ground, giving up spores in spring which repeat the infection.

Early and clean cultivation greatly aids control by reducing the number of spores set free.

As a result of comparative tests in 1916 and 1917 it is found that while Bordeaux mixture is safe at a strength of 2:2:50 in case of good sanitation and timely applications, the 1:1:50 strength is not to be recommended for commercial use, but the 3:3:50 formula may be used with full confidence in Wisconsin. Lime-sulphur at a specific gravity of 1.2946 diluted at the rate of 1:40 or 1:30 was also satisfactory, especially when containing lead arsenate ($\frac{1}{2}$ to 1 lb. in 50 gal. water, or if in the form of paste, 1 to 2 lbs.).

Dusting for peach scab. H. E. THOMAS (*Virginia Sta. Rpts.* 1915-16, pp. 184-186, figs. 2).—A preliminary trial was made of a dry lime and sulphur mixture (1:3) on peach scab (*Cladosporium carpophilum*) at Blacksburg during the season of 1916. The applications were made with a power dusting rig from both sides of the row on June 29, July 14 and 31, and August 14, the amount averaging 0.8 lb. per tree for each application. The dust adhered well to the fruit, but not to the foliage.

The efficiency of the dust application was rated as remarkably high, considering that the scab had become well established before the first application was made. The mixture prevented the spread of the scab to noninfected fruit, 78.6 per cent of the fruit being clean on the dusted tree, as compared with 0.4 per cent on the check. It also checked the development on infected fruit or prevented reinfection, 73 per cent of the fruit on the check tree being classed as heavy scab, as opposed to 0.1 per cent on the dusted tree. This treatment is therefore considered a promising means of control for peach scab.

Fungus diseases [of cranberries], H. J. FRANKLIN (*Massachusetts Sta. Bul.* 180 (1917), pp. 186-193).—These investigations were conducted as in previous years (E. S. R., 36, p. 51) in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture.

Comparison of the tabulated results of spraying experiments with Bordeaux mixture showed that as a rule the areas sprayed in 1915 were less productive in 1916 than were the checks, also that the fruit from the sprayed areas was inferior as regards keeping quality. Apparently injury from Bordeaux mixture weakens the resistance of the berries to disease. Blackleaf 40 solution (0.25 per cent) with fish-oil soap (2 lbs. to 50 gal. water) affected but little the quality of the fruit and showed no fungicidal value in the storage tests, but these experiments are not regarded as conclusive. Corona arsenate of lead (3 lbs. to 50 gal. water) gave little if any increase in yield, but an improvement was noted in the keeping quality of the fruit. Most of the rot in berries of the variety Early Black was found to be due to anthracnose (*Glomerella rufomaculans vaccinii*). Areas treated by putting copper sulphate in the flowage

showed no definite advantage, either in the quantity or in the keeping quality of the fruit.

False blossom was unusually abundant on the station bog this season, the moist conditions supposedly favoring greatly the development of *Exobasidium oxycocci*, the cause of this disease, which this year attacked blossoms as well as leaves.

Observations on the spoilage of cranberries due to lack of proper ventilation, C. L. SHEAR, N. E. STEVENS, and B. A. RUDOLPH (*Massachusetts Sta. Bul.* 180 (1917), pp. 235-239.)—Tests made with cranberries of several varieties from different sources kept in an atmosphere of nearly pure carbon dioxide resulted in the spoilage of almost all such berries, which also showed a dull red color. The controls kept in the air showed very little rot even at the end of two weeks. Confirmatory tests are described. Humidity appears to have no influence on the effect of the carbon dioxide, and the same is true of the different fungi present, which are usually also unfavorably affected by the carbon dioxide. The importance of ventilation is indicated.

Downy mildew in vines, H. E. LAFFER (*Jour. Dept. Agr. So. Aust.*, 20 (1917), No. 12, pp. 970-977).—In a report dealing with insect injury and reconstitution of vineyards in New South Wales, it is stated that for the first time in Australia grape downy mildew (*Plasmopara viticola*) has been identified in the vineyards of Victoria, the infected area being spread over some 400 square miles in the northeastern portion of the State. It is thought that the disease may possibly have been present for several years, but only in the past season have the frequent summer rains and other weather conditions favored sufficient development of conidiophores to enable the fungus to be identified with certainty. The development of the conidiophores is greatly increased by the proximity of even small areas of water surface, as dams or drains.

Citrus diseases, J. A. STEVENSON (*Porto Rico Dept. Agr. Sta. Rpt.* 1917, pp. 78-83).—Notes are given on citrus scab due to *Cladosporium citri*, fruit rots caused by *Penicillium* spp. and *Diplodia* sp., crown rot of seedlings due to *Sclerotium rolfsii*, and on the parasitism of mistletoe (*Dendropemon* spp.).

Progress Texas is making toward the eradication of citrus canker, E. L. AYERS (*Bul. Agr. and Mech. Col. Tex.*, 3. ser., 3 (1917), No. 7, pt. 1, pp. 37, 38).—In an address to the Texas Farmers' Congress in 1916 the author stated that rapid progress had been made toward eradicating citrus canker. Though at one time scattered through the entire citrus-growing area of the State, this disease has been almost entirely confined to the three counties where it was first prevalent, and it is decreasing in that area.

Comparative studies on soils affected or not affected with gummosis.—I, The soil reaction, S. TIJMSMA (*Bul. Deli Proefstat, Medan*, No. 9 (1917), pp. 41).—An extension of studies previously noted (*E. S. R.*, 33, p. 22) is reported to have shown no distinct difference in reaction between soils carrying the infection responsible for gummosis and those which were free from such infection.

Melanose, II, H. E. STEVENS (*Florida Sta. Bul.* 145 (1918), pp. 101-116, figs. 7).—In continuation of a report made in connection with Floyd (*E. S. R.*, 28, p. 651), the author states that melanose of citrus leaves, fruits, and young stems, previously shown to be due to *Phomopsis citri*, is found chiefly in dead twigs and branches. These constitute the principal sources for the spread of this disease, which does not extend itself from either foliage or fruit, though the fruit is subject to injury by this fungus during several months.

Removal of dead wood is thought to offer the most practical means at present available for reducing the ravages of melanose, which is thought to be the

most injurious disease attacking citrus fruits and to cause increasing loss each year in Florida.

Diseases and pests of tea on the east coast of Sumatra, C. BERNARD (*Dept. Landb. Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 54 (1917), pp. 1-15*).—The author briefly discusses, along with animal enemies of tea, a *Fomes* causing root disease, also other causes of loss or injury, as red rust (*Cephaleuros virescens*), brown blight (*Laetitia* sp.), gray blight (*Pestalotzia palmarum*), and sooty blotch (*Capnodium* sp.).

Nematode diseases of narcissus, J. RITZEMA BOS (*Tijdschr. Plantenziekten, 23 (1917), No. 3, pp. 99-135*).—The author describes a stem disease of narcissus ascribed to a nematode (*Tylenchus devastatrix*) which is said to be parasitic on many other plants. A list of these plants is given along with a discussion of the possible specialization of this nematode.

Biological observations on *Puccinia vincae*, F. VINCENS (*Bul. Soc. Path. Veg. France, 4 (1917), No. 1, pp. 30-36, fig. 1*).—A brief account of study of *P. vincae* concludes with the statement that the teleutospores found on *Vinca major* will not cause infection of *V. minor*. From this fact it is inferred that there exist two biological species of *P. vincae*.

A practical method of preventing the damping-off of coniferous seedlings, C. A. SCOTT (*Jour. Forestry, 15 (1917), No. 2, pp. 192-196, pls. 2*).—A method said to be practical and highly satisfactory is described for sterilizing forest nursery seed beds with steam delivered at 120 to 160 lbs. pressure for from 35 to 45 minutes under inverted pans previously weighted down. This plan has stood the test of use for two seasons very favorable to the fungus causing the damping-off of coniferous seedlings, except in the case of the Engelmann spruce. The unsterilized beds of all species showed almost a total loss.

Germination in the sterilized beds occurred from two to four days earlier and was more nearly complete, giving a considerable saving in the cost of seeds. This method also destroys all weed seeds, thus eliminating the cost of weeding and counterbalancing thereby the entire expense of sterilizing the beds. The seedlings in the sterilized beds made a much more vigorous growth, attaining before the close of the growing season from two to four times the size of those on the untreated beds.

Effects of mistletoe on young conifers, J. R. WEIR (*Jour. Agr. Research [U. S.], 12 (1918), No. 11, pp. 715-718, pl. 1*).—In the course of work done in the Bureau of Plant Industry on injury to conifers by mistletoes of the genus *Razoumofskyia* (*Arceuthobium*), in part noted previously (*E. S. R., 34, p. 547; 35, p. 459; 37, p. 458*), the author was able to demonstrate the suppression of growth in young trees by this parasite. In *Pinus ponderosa* the internodes as well as terminal and lateral buds of the main shoot were greatly reduced by the action of the mistletoe. In case of *Pseudotsuga taxifolia* the buds were greatly reduced, the food normally stored therein going elsewhere to form brooms and burls, this fact probably bearing an important relation to the stunting of the tree and a staghead appearance. The actual storage of food materials in mistletoe brooms became apparent in the production of needles on detached brooms kept in damp situations, normal branches showing very little disposition to throw out needles, though kept in the same damp, shady situation.

The author concludes that false mistletoes are seriously injurious to the young conifers in the forest, especially as these, when infected on the main stem (the usual way), do not recover so as to produce merchantable material. The young tree does not pursue the usual plan of excurrent growth in such cases. It may become practically a continuous witches' broom or else die

outright. All infected trees, especially those overtopping other trees, should be destroyed.

A disease of walnut due to *Armillaria mellea*, P. GUINIER (*Bul. Soc. Path. Veg. France*, 4 (1917), No. 1, pp. 27-29).—*Armillaria mellea* is noted as causing the death of walnut in certain regions which are named.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report of the entomological department, J. Troop (*Indiana Sta. Rpt. 1917*, pp. 39, 40).—The grape colaspis is said to have shown great activity in corn fields, particularly in the southern counties of Indiana. On one farm examined, a field which had been in timothy the previous year was so badly infested that it had to be disked under and replanted, while in an adjoining field, which had been in wheat the previous year, no infestation could be found.

During June, 1917, several carloads of potatoes which were received in the Indianapolis market from Australia were found to be badly infested with the potato tuber moth.

Report of the entomological department, E. C. SMYTH (*Porto Rico Dept. Agr. Sta. Rpt. 1917*, pp. 99-106).—This statement of the work of the year deals particularly with plant inspection and quarantine and the fumigation of imported cane for grinding. The importance of preventing the introduction of the cane butterfly *Calisto archebates* in cane from Santo Domingo is again pointed out (E. S. R., 36, p. 753). In addition to the cane butterfly three cane beetles are annually intercepted by the hundreds through fumigation with sulphur dioxid, namely, the Santo Domingo cane weevil root borer (*Diaprepes quadrivittatus*), the Santo Domingo cane weevil stalk borer (*Metamastus sericeus*), and a large black histerid beetle that seems to work in cane, *Hololepta quadridentata*.

Report of the assistant entomologist, R. T. COTTON (*Porto Rico Dept. Agr. Sta. Rpt. 1917*, pp. 107-122, figs. 8).—This consists largely of a report of investigations of several tobacco insects, including the tobacco leaf folder (*Pachyzancla periusalis*), the large tobacco suck fly (*Dicyphus luridus*), and the small tobacco suck fly (*D. prasinus*). A heavy infestation of slugs (*Veronicella lapas*) at the time of planting is said to have resulted in considerable damage to the young plants. This pest, however, is fairly easily controlled, the most effective and cheapest method consisting of collection with the aid of lanterns when they come out to feed at night. Flea-beetles, which are the worst insect pests of tobacco in Porto Rico, are being controlled by lead arsenate in powder form applied with small dust guns at the rate of 50 lbs. of arsenate of lead to 50 lbs. of dry, leached, wood ashes. Two plant bugs which are abundant in all sections of the tobacco district and damage the leaves were found to be new to science and have been described by Gibson under the names *D. luridus* and *D. prasinus* (E. S. R., 37, p. 561), both of which have been studied and are here reported upon.

The tobacco leaf folder (*P. periusalis*) is of wide occurrence in Porto Rico and has been recorded as occurring in the United States and Brazil. It feeds exclusively on solanaceous plants, tobacco being its favorite among cultivated plants, although the weeds *Solanum torvum* and *S. nigrum* are undoubtedly its main food plants. It is abundant in all localities throughout the tobacco districts, but attacks the plants only when they are young and tender. The young larvae on hatching out commence to feed on the leaf near the midrib and after some growth form a feeding shelter by folding over a portion of the edge of the leaf and fastening it down with silk strands, within which they

feed, occasionally changing their quarters and folding the leaves in a fresh place. The eggs, which are deposited singly on the underside of the tobacco leaves, hatch in from 5 to 8 days. During the next 18 or 20 days the larva molts four times at more or less regular intervals. At the end of this time it rolls itself up in a portion of the leaf and passes 3 days in the prepupal and 12 days in the pupal stage. Thus the life cycle from oviposition to the emergence of the adult varies from 35 to 44 days, with an average length of 39 days.

It is parasitized by both hymenopterous and dipterous parasites, including unidentified egg parasites, a tachinid (*Argyrophylax albincisa*), and an ichneumonid (*Chleonus* sp.) reared from the larvæ, and a small braconid reared from the pupæ. The pest is rather easy to control, it being held in check on plants that have been systematically dusted with arsenicals to control the flea-beetles. The destruction of wild host plants occurring in the vicinity of tobacco fields is recommended.

The large tobacco suck fly (*D. luridus*), the more abundant of the two new plant bugs found on tobacco, was first noticed by the author in the spring of 1916. At present it is known to occur only in Porto Rico where it is widely distributed wherever tobacco is grown. Tobacco is attacked by it in all stages of growth, the leaves being damaged, the plant weakened, and the quality of the leaf lowered. The eggs, which are inserted singly in the midrib of the tobacco leaves, hatch in from 6 to 10 days. There are five nymphal stages of more or less equal length, the total length of the life cycle from oviposition to the appearance of the adult varying from 25 to 38, with an average of 30 days. The damage caused by this pest at the present is not sufficient to warrant special treatment. The practice of keeping the ground free from the weeds which harbor it during the interval between crops is the most practical method of holding it in check.

The small tobacco suck fly (*D. prasinus*), while abundant on tobacco, is not so abundant as the larger species but on the tomato is found more frequently than is *D. luridus*. Its life history is very similar to the large tobacco suck fly and it is controlled in a similar manner.

Citrus insects mentioned include the large striped leaf-eating weevil (*Diaprepes spengleri*), which was exceptionally abundant during the month of May and did considerable damage to citrus foliage; *Solenopsis geminata*, which was a source of injury in some groves; and caterpillars of the orange Papilio (*Papilio androgeus*) and of the leaf-roller (*Eantis thraso*) which were fairly common in some groves.

The difficulty experienced in making a good oil emulsion due to the inability to get a caustic potash soap led to experiments and the discovery of a method by which the soda or hard soap can be used in making an emulsion that will not semi-solidify soon after it is made. It was found that an excellent emulsion that would remain in good liquid form for several days can be made in the following manner: Eight lbs. of soap (either Octagon or fish-oil soap) is dissolved in 2 gal. of water by heating. While hot 2 gal. of Corvus oil is slowly added and vigorously stirred. After the emulsion has been made, 0.25 lb. of ordinary cooking flour is added and thoroughly stirred, then 4 gal. of water added and the whole mixture again heated until it boils. The emulsion is then removed from the fire, 1 qt. of carbolic acid added, and is ready for use. For spraying it should be diluted at the rate of 1 part stock to 25 parts of water.

How to combat rabbits, gophers, prairie dogs, coyotes, ants, and grasshoppers, A. L. PASCHALL (*Arizona Sta. Bul. 81* (1917), pp. 321-338, figs. 11).—A practical summary of information.

[Work with cranberry insects in 1916], H. J. FRANKLIN (*Massachusetts Sta. Bul.* 180 (1917), pp. 223-234).—The author reports that the beetles which infested cranberry roots the previous year (E. S. R., 36, p. 54) were reared to adults and identified as the cranberry rootworm (*Rhabdopterus picipes*), studies of which insect by Scammell have been noted (E. S. R., 33, p. 456). The application of 2.25 lbs. of arsenate of lead and $1\frac{1}{2}$ heaping teaspoonfuls of white arsenic to 40 gal. of water applied on July 3 and repeated on the eleventh and eighteenth days appeared to have destroyed the beetles.

The submergence of the eggs and caterpillars of the gipsy moth for varying periods are reported upon. The results, together with observations of bog flooding, led to the conclusion that reflowing for the gipsy moth will be most satisfactory if done while the worms are small and before the largest are more than $\frac{5}{8}$ in. long. The sooner it is done after all the eggs have hatched the less will be the damage from the feeding of the worms and the less the trouble from their floating ashore alive, as it appears to be the habit of the very young caterpillars to cling to their support when submerged. To be entirely effective, even when the worms are small, the flowage must be held for nearly 40 hours. A brief report of experiments by C. W. Minott on the wind dispersion of gipsy moth caterpillars on cranberry bogs conducted during May and June, 1916, is incorporated. Six cotton cloth screens in two sections, each section being 3 by 10 ft., to which tanglefoot was applied were located on bogs at distances from woodland infestations ranging from 400 to 1,200 ft. From one screen located at 600 ft. from infested woodland on the northwest and 900 ft. on the west, 62 small caterpillars were removed during the season, or slightly more than one to the square foot.

Observations of the season on the effect of resanding on the abundance of the cranberry tipworm (*Dasyneura vaccinii*) sustained the conclusions previously reported. A chalcidid (*Tetrastichus* sp.) and two prototrypids (*Aphanogmus* sp. and *Ocraphron* sp.) were reared from the larvæ of the last brood after they had encased themselves in their cocoons.

In control work with the black-head fire worm blackleaf 40 at the rate of 1:400 to which was added resin fish-oil soap at the rate of 2 lbs. to 50 gal. of water failed to control the first brood entirely, but checked the pest sufficiently so that the plats remained green while the surrounding bog had turned rather brown. The application of nicotin sulphate appears at present to be the only really effective measure of controlling the first brood, two and perhaps three applications being advisable. As a treatment of the second brood it may have to compete with arsenate of lead, which is far more effective with the second brood than with the first.

The injury caused by the cranberry fruit-worm in 1916 was the least of which there is any record. Parasitism of its eggs by *Trichogramma minuta* ranged from 25 to 75 per cent on dry bogs and from none to about 75 per cent on those with winter flowage. Parasitism by *Phanerotoma franklini*, previously referred to as *P. tibialis*, ranged from 24 to about 55 per cent on dry bogs (without winter flowage) and from none to about 33 per cent on flowed ones. *Pristomeridia agilis* was very scarce, the percentage of parasitism ranging from none to 5.5 on flowed bogs and from 4.5 to 10 on strictly dry ones. Submergence tests are reported, which seem to prove that the effect of submergence on the worms in their cocoons depends largely on the temperature of the water, and suggest that a flowage after picking if begun before October 1 and continued for 12 or possibly even 10 days may control this insect as well as late holding of winter flowage usually does. Under the heading of bog management the effect of late holding of a deep winter flowage, etc., are discussed.

The life history and control of the rose leaf-hopper.—An apple pest, L. CHILDS (*Oregon Sta. Bul. 148 (1918), pp. 3-32, figs. 14*).—The occurrence of the rose leaf-hopper (*Empoa rosæ*) in injurious numbers in several apple-growing sections of Oregon during 1912-13 led to the study of its life history and control by the author, here reported, commenced in 1914.

Since the extreme prevalence of the leaf-hoppers during 1912-13 no general infestation of all orchards has occurred in the Hood River Valley, but during both 1914 and 1915 younger orchards could be found swarming with these insects in the summer and early fall and they were the source of much injury. The leaf-hoppers do not feed upon the fruit, their attacks being confined entirely to the under surfaces of the foliage and the extent of the injury is difficult to estimate. The studies have shown that there are two generations a year in the Pacific Northwest.

The winter is passed in the egg state in the canes of wild and cultivated rose, Evergreen blackberry, the runners of the strawberry, and to a much less extent in the tissues of other berry plants. Very few overwintering eggs are found in apple twigs in the proximity of rose bushes. In 1915 the first overwintering eggs were found hatching on the rose on April 14, and the first nymphs were observed on the apple on April 19. On the rose the hatching progressed rapidly, being completed by May 1, but on the apple hatching was more gradual. Upon hatching out the young nymph wanders about in search of a leaf on the inside of which when found it settles and at once begins feeding. In 1915 the migration from the rose began June 1 and by June 6 in large numbers, but very few remaining on rose bushes on June 8.

Oviposition by the summer generation occurs throughout the greater part of July and August, but toward the latter part of August they become fewer in number and by the first of September have practically disappeared. In 1915 the first nymphs of the second generation began hatching out on July 7, continued to increase until August 10, and had practically ceased by August 23. The average of the five nymphal periods of the first brood in May and June, 1915, was 7.3, 8.5, 5.7, 5.9, and 8.2 days, respectively, for 30 individuals, or a total average nymphal period of 35.6 days. The average nymphal periods of the second generation during July and August for 33 individuals was 4.1, 4.4, 4, 4.8, and 6.4, with an average total of 23.7 days. During August and September the length of the instars was somewhat greater, with an average total nymphal period for 14 individuals of 34 days. Breeding cage observations indicate that unmated individuals of the first generation may live as long as 116 days, and those of the second generation 129 days.

The species does not suffer to any great extent from parasitic enemies, an egg parasite (*Anagrus armatus*), which has been found to parasitize fully one-third of the eggs of the leaf-hopper, being the only insect that has been found to reduce the leaf-hopper materially. It has been found that in cases where the leaf-hopper has an opportunity to choose the most desirable host plants in which to deposit overwintering eggs 92.7 per cent of the eggs are deposited in the canes of the rose. It is believed that if rose bushes and hedges are properly trimmed and sprayed before the insects become winged much success in keeping down the numbers of insects in apple orchards will result.

"The use of lime-sulphur in the 10-day and 30-day scab sprays has been found effective in controlling the first generation in apple orchards. The spray has to be applied while the insects are in the first to third nymphal stages in order to be effective. After this period blackleaf 40 (1:1,200) plus 5 lbs. of soap to 100 gal. of water has been found satisfactory in destroying

the hoppers. On roses blackleaf 40 (1:2,000) plus 5 lbs. of soap to 100 gal. of water is effective when applied to insects in the first to third stages of their growth. For insects in the last two stages of their development increase the blackleaf 40 to 1:1,200. All sprays should be directed upward, in order to strike the insects, which are all located on the under surfaces of the leaves."

A list of 25 references to the literature is included.

The aphid of chokecherry and grain (*Aphis pseudoavenæ* n. sp.), EDITH M. PATCH (*Maine Sta. Bul.* 267 (1917). pp. 293-297, fig. 1).—Under the name *A. pseudoavenæ* n. sp. the author describes a plant louse, which resembles *A. avenæ* morphologically but the fresh colonies which crowd close along the stem and ventral leaf suggest at once the *A. rumicis* group, on account of the conspicuous areas of wax powder, and can not be mistaken for *A. avenæ* in life.

The species was found late in June, 1917, heavily infesting a group of chokecherries on the campus of the University of Maine and specimens had been collected at Fort Kent, Me., July 6, of the previous year. Progeny of the winged June migrants were placed on various grasses, and found to accept timothy, Kentucky blue grass, sheep fescue, meadow fescue, redtop, barley, and oats.

Technical descriptions are given of its several forms. The author points out that this species is not the *A. avenæ* of American authors or of Theobald, nor the *A. padi* described and figured by Koch and Buckton. It is thought that it may possibly "in part" be the *A. padi* of Van der Goot, although it does not accord with his collection from *Mespilus* and *Pyrus malus*.

The European corn borer (*Pyrausta nubilalis*).—A recently established pest in Massachusetts, S. C. VINAL (*Massachusetts Sta. Bul.* 178 (1917), pp. 147-152).—The author records the recent introduction and establishment of this well-known European pest in the vicinity of Boston and gives a preliminary account of the present status of knowledge of it, based upon a review of the literature and observations by the author.

In work during the summer of 1917 many corn plants were found by the author to be tunneled by this borer. During July nearly every infested plant could be readily detected through having its tassel broken over and hanging pendent just above the first two or three spikes, as a result of the larvæ tunneling in the pith of the main tassel stalk, so weakening it that it was readily blown over by the wind. The species is widely distributed in Europe and Asia, having been reported in literature as occurring in central and southern Europe, west central and northern Asia, and Japan, in which localities its food plants consist of corn, hemp, hops, millet, and several wild grasses. Corn and hop plants are severely damaged by it, 50 per cent of these crops being destroyed in some sections of central Europe. Of its several food plants hemp is the only one offering ideal conditions for its importation. It is thought probable that plants infested by it were cut and shipped during the fall and winter months to a cordage company in the vicinity of Boston, and the hemp not having been used at once the larvæ transformed to pupæ in early spring and soon emerged as moths.

Early sweet corn grown in market gardens 10 to 12 miles inland has been seriously attacked by this pest for the past three or four years and from this the author infers that the pest was imported about 1910. At the present time the area of infestation is approximately 100 square miles in extent and is located immediately north and northwest of the city of Boston. Sweet corn is the only valuable commercial crop seriously attacked by it there, since the other food plants are not grown. The most commonly infested weeds and

grasses are barnyard grass, pigweed, and foxtail grass. Dahlia stems are also injured.

With the exception of the leaf blades the whole corn plant above ground is subject to the attacks of these voracious caterpillars. After emerging from the egg the larvæ commence feeding on the unopened staminate flowers borne by the tassel or immediately pierce the sheath near its junction with a node. "Those which feed on the tassel bore a hole in the side of the buds and feed on the internal succulent parts. Soon these small caterpillars leave the tassel buds and enter the tassel stalks, or terminal internode, where they tunnel through the pith and finally complete their larval life in this internode. These tunnels so weaken the terminal internode that it soon becomes broken over, a type of injury which is especially noticeable on the early corn crop. It is quite evident that this injury indirectly affects the formation of corn on the cob by destroying the pollen necessary for fertilizing the corn silk.

"Those larvæ which do not feed on the tassel immediately pierce the sheath surrounding an internode, usually where the edges overlap at its junction with a node. Here they feed on the internal surface of the sheath, excavating a groove halfway around the stalk, and then bore directly into the pith where they form long winding tunnels. Whenever the larvæ during their tunneling operations reach a node, a rather large cavity is usually formed. From this cavity the larvæ sometimes bore through the node, but more often they turn and tunnel in the opposite direction in the originally infested internode. At the termination of the feeding period nearly all of the central portion of the stalk has been eaten, and this so weakens the plant that a strong wind is likely to break over the stalk, thus completing the destruction commenced by the caterpillars.

"A number of these stalk-boring larvæ very often attack the small stalk or pedicel bearing the ear, and in some cases may bore directly through this into the developing ear. This injury to the pedicel causes the ear to wither and die.

"The most serious damage to the crop is caused by the large percentage of the second brood larvæ which immediately enter the ear after hatching. The injury by this brood to the corn ear is very similar to that caused by the well-known corn ear worm (*Chloridea obsoleta*). Besides feeding on the kernels in a similar manner to the corn ear worm, the European corn borer exhibits characteristic tunneling habits and bores through the cob."

A brief summary is given of its life history, the details of which have not been worked out. There are two broods a year, hibernation taking place as full-grown or nearly full-grown larvæ within their tunnels in the cornstalks, and in some cases in the cob. These larvæ pupate in the spring and emerge as moths, probably the latter part of May. "Soon after emergence the females begin laying eggs on the cornstalks, and in a few days these hatch. The young larvæ begin feeding at once, and quickly eat their way through the sheath before they tunnel in the main stalk.

"On reaching maturity, which occurs the latter part of July, the larvæ clear out a portion of the burrow, prepare an opening through which the adults can escape, and after spinning a thin silken partition across the top and bottom of this cleared space, transform to pupæ. The moths emerge for the second brood in about two weeks. This brood of larvæ becomes full grown by late fall, but does not transform to pupæ at once as in the first brood. Instead, the winter is passed as larvæ within the stalks."

There appears to be no means of destroying the pest during the summer through the use of insecticides since all of its transformations take place within

the plant. The principal means of control lies in the possibility of establishing a system of cultural methods which will prevent the injury. Since the winter stage is passed in the food plant, control measures consist in burning the stalks during the fall and winter, burying the stalks, or feeding the stalks before emergence takes place in the spring. The importance of cooperation in control work is emphasized as a few neglected stalks are likely to harbor enough borers to infest the spring crop severely.

Cankerworms.—Life history and control of this orchard and shade-tree pest, W. H. GOODWIN (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 3, pp. 89-92, figs. 2).—A popular summary of information on cankerworms and measures for their control.

It is stated that counts made of eggs in about 600 clusters collected in north central Ohio the latter part of March, 1916, gave an average of 131 eggs per cluster. Counts made of several hundred clusters collected during 1917, in which year the weather during oviposition was unusually favorable, gave an average of 258 eggs per cluster.

The biology of the alder flea-beetle (*Altica bimarginata*), W. C. Woods (*Maine Sta. Bul.* 265 (1917), pp. 249-284, pls. 3).—This flea-beetle, described by Say in 1824, has appeared in Maine periodically in enormous numbers, but notwithstanding its wide distribution, occurring as it does from Maine to California, no detailed work on its life history appears to have been published.

Of the outbreaks in Maine that of 1914 appears to have been the most severe, the leaves having been riddled by attacks of hibernating adults even before the larvæ appeared. By the middle of August of that year practically all the leaves of every alder bush at Orono attacked had been skeletonized by the larvæ and the trees looked brown and bare as though swept by fire. There was a great reduction in the number of beetles appearing the following year, and in 1916 this beetle was so rare that no larvæ and but a single adult could be found at Orono, for which extraordinary disappearance the author is unable to offer any satisfactory explanation.

In nature the flea-beetle is confined almost entirely to the leaves of the alder, the only other plant on which the author has taken it being the willow (*Salix rostrata*). There is, however, a biological race of this species which occurs on balsam poplar at Veazie, Me., the larvæ and adults of which eat alder or willow as readily as they eat balsam poplar. The forms taken on alder, however (both larvæ and adults), have been tested many times on the leaves of balsam poplar but with negative results.

As with the greater number of other chrysomelids this beetle hibernates as an adult, seeking winter quarters in Maine late in September and emerging the following spring as soon as the alder leaves are well expanded. The yellow eggs are deposited from mid-June to late July in clusters on the foliage. The larvæ hatch out in from 7 to 10 days and feed upon the leaves, which they skeletonize. The average duration of the three larval instars is 6.3, 8.0, and 13.2 days, respectively; that of the prepupal period 7 days, and of the pupal period 10.2 days. Before pupating the larvæ enter the ground to form their pupal cells.

Technical descriptions are given of the several stages, together with details of life history studies.

Its natural enemies include the parasitic fungus *Sporotrichum globuliferum*, to whose attack all stages, except the egg, are susceptible, and a tachinid, *Hyalomyodes triangularis*, reared by the author from the adult beetles. Although the author has had no occasion to conduct control work there is no reason to suppose that the measures employed in combating other flea-beetles, especially a thorough spraying with arsenate of lead at the rate of 3 lbs.

(paste form) to 50 gal. of water as soon as the beetles appear in the spring and repeated in late June and mid-July for the larvæ, where necessary, will not control it.

The bulletin concludes with a discussion of its synonymy in which it is pointed out that the generic name *Altica* holds by priority.

A 5-page bibliography is included.

Bark beetles infesting the Douglas fir, W. J. CHAMBERLIN (*Oregon Sta. Bul.* 147 (1918), pp. 5-40, figs. 15).—In this account of studies of bark beetles of the superfamily Scolytoidea a key is first given to the families of which there are three (Ipidae, Scolytidae, and Platypodidae) and their subfamilies, of which there are five of the former and one each of the two latter.

In considering the several species, of which there are 22, descriptions are first given of the adult, etc., followed by notes on distribution, hosts, biology, and economic importance. The Douglas fir bark beetle (*Dendroctonus pseudotsugæ*), *Eccoptogaster unispinosus*, *Pseudohylesinus grandis*, *P. nebulosus*, *Xyleborus xylographus*, and *Typhodendron lineatus* are the species of which the more extended accounts are given.

The greenhouse red spider attacking cucumbers and methods for its control (*Tetranychus bimaculatus*), S. C. VINAL (*Massachusetts Sta. Bul.* 179 (1917), pp. 153-182, fig. 1).—Numerous inquiries received from market gardeners in regard to the control of the red spider attacking greenhouse cucumbers in Massachusetts led to the investigation here reported. This spider mite is the most widely distributed and destructive pest of greenhouse cucumbers, being particularly injurious in the market-garden district of Boston. It is estimated that the annual loss to cucumber growers in this district through red spider injury amounts to approximately \$150,000, or 10 per cent of the whole crop.

The greenhouse vegetables most subject to attack are cucumbers, eggplants, and tomatoes. Greenhouse flowers subject to attack are roses, violets, sweet peas, carnations, chrysanthemums, etc. Plants in the vicinity of greenhouses subject to attack are beans, eggplants, celery, tomatoes, strawberries, clover, grasses, and weeds.

"Experimentation on the control of this mite attacking cucumbers gave no fumigant which could be used with safety to the foliage. Sulphur burned to form sulphur dioxide proved to be very effective in killing all stages of mites. Although this gas is deadly to plant life, its application as a fumigant to rid empty greenhouses of red spiders is extremely useful.

"Many spray mixtures proved to be efficient in controlling actively feeding mites, but did not affect those in quiescent stages of development. For the control of all stages above the egg stage linseed oil emulsion proved to be most satisfactory. The control of the red spider may be accomplished by combining preventive and repressive measures. Clean culture, or the eradication of weeds and plants which harbor mites during the winter period, either within or outside the greenhouse, is by far the most vital means of prevention in cucumber greenhouses. Dispersion within the greenhouse may be hindered by destroying plants or parts of plants which harbor the initial infestation.

"Applications of linseed oil emulsion at weekly intervals during the early life of the plant prove very effective if made with extreme care. At least three applications must be made for an efficient control. By checking red spider infestation early in the season the producing period of the plants is lengthened approximately one month."

The formula given for the linseed oil emulsion for 100 gal. of spray is 5 gal. of hot water, 1.5 lbs. of Ivory soap, and 1 gal. of raw linseed oil.

FOODS—HUMAN NUTRITION.

The limiting factors in the food supply of the nation at war, A. E. TAYLOR (*Johns Hopkins Univ. Circ., n. ser., No. 2 (1918), pp. 5-24*).—In this treatise the author sets forth the problems of war-time food supply. It is pointed out that more food must be produced or less consumed.

"Increased production of foodstuffs is as much a military necessity as increased production of explosives. Reduced consumption of foodstuffs in certain directions, in order to fulfill . . . [the] obligations [of the United States] to . . . [her] Allies, is as much a war measure as sending military forces to France. . . .

"The limiting factors in cultivation of the soil and husbandry are climate, capital, labor, fertilizers, seed, machinery, and transportation."

Women are urged to undertake farm labor; also the making of war gardens.

"Confronted with a large increase in . . . consuming population through having assumed the feeding of a portion of the allied peoples, reduction of consumption becomes a direct necessity."

Hoarding and waste are two factors that increase consumption unduly.

"Repression of ingestion is the final step in the conservation of food." . . .

"Without going to the limit of bearable repression of intake of food, it is clear that a people may safely reduce the consumption of food 25 per cent—this including reduction of waste and repression in intake. . . . Of course, . . . strongest efforts [must be exerted] for increased production, but . . . [it] must [be] expected to supplement these by the savings achieved through reduced consumption. . . .

"Repression in the consumption of food can not be successfully accomplished without repression in the use of other commodities. . . . Food [can not be saved] unless there is a saving in luxuries. . . . There is no saving of food without the possession of a sacrificial consciousness."

The nutrition of the child (*Bul. Kans. Bd. Health, 13 (1917), No. 9, pp. 199, 200*).—This is a portion of an article entitled *The Worth of a Child*. The conclusion is reached that the high cost of living and uncertainty as to what substitution to make in the dietary of the family has led to defective and deficient feeding and that already young children in parts of America are feeling the stress of the war. The importance of maintaining the milk ration intact is pointed out.

The diet of prisoners of war in Germany, A. E. TAYLOR (*Jour. Amer. Med. Assoc., 69 (1917), No. 19, pp. 1575-1582*).—Details concerning the management of German prison camps are given. In theory, the prisoner of war is supposed to receive the ration of the army of his country, and this is, with his pay, charged against his country to be paid at the close of the war.

Two weekly diet sheets are presented which illustrate the subsistence in the German prison-of-war camps. The first, which is typical of the period prior to stringency of foodstuffs, calls for a per diem ration per prisoner of 89 gms. protein, 30 gms. fat, 510 gms. carbohydrate, with a total yield of 2,740 calories. The second diet sheet reveals the fact that during the period of stringency in foodstuffs prisoners were receiving per diem but 57 gms. of protein, 21 gms. of fat, 310 gms. of carbohydrate, and a total yield of 1,720 calories.

The author comments that "the intake of the prison-of-war camps in Germany since June, 1916, must have meant subnutrition for all of the nonworking men who had no other food supply, and death directly and indirectly to some." "It is apparent that our Government must undertake and organize the feeding of Americans who may be taken prisoners of war and confined in Germany." Food parcels can now be sent in via Berne or Copenhagen.

"My money won't reach:" The experience of 377 self-supporting families in New York City in endeavoring to make their incomes provide the essentials for healthful living, EMMA A. WINSLOW (*New York: Committee on Home Econ. Charity Organ. Soc., 1918, pp. 22*).—The results of an investigation by the Committee on Home Economics of the Charity Organization Society of the City of New York are reported.

"The food readjustments among the families seem to have been practically the ones which are normally made under economic pressure. Meat, milk, butter, eggs, fruits, and vegetables were reported as being used in much smaller amounts, and frequently certain or even all of these foods were left out of the diet completely. Bread, macaroni, tea, and coffee were being often used in increasing amounts, supplemented to a larger or smaller degree by other foods according to the amount of money available for food and the family's personal likes and dislikes."

The data concerning milk consumption are specially interesting in view of the present milk situation. The number of families reporting the use of the same amount of milk as formerly, although often a cheaper grade, and those reporting the use of less milk than formerly or none was about the same.

There seems, because of their lessened use of other foods, in many families, to be a radical increase in bread and macaroni consumption as a greater use of bread or macaroni is deemed the best way to feed a family when every penny must be considered. With income and living costs in more nearly their normal relationship and with a certain amount of educational guidance, it would seem to be a simple matter to have such families return to a wider use of milk, eggs, fruits, vegetables, and other foods not equally to be conserved, thus automatically using less bread.

"Food waste among the groups is negligible."

Is the table d'hôte meal wasteful? (*Hotel Mo., 26 (1918), No. 301, p. 38*).—The custom followed by successful table d'hôte caterers in the choice of dishes offered to patrons in this type of meal is discussed, the conclusion being that this type of meal is the more economical if well planned and without too great a choice of dishes.

Iroquois foods and food preparation, F. W. WAUGH (*Canada Dept. Mines, Geol. Survey Mem. 86, pp. 235, pls. 39, figs. 2*).—Present-day Iroquois food customs and those that have been practiced within the memory of the older people now living on the reservations are selected for this discussion. Of special interest are the methods of food preparation and recipes given for corn as well as for many other foods. References are made to the literature and anthology of the subject.

Aquatic products as food, H. F. MOORE (*Amer. Food Jour., 13 (1918), No. 1, pp. 21, 22*).—This article points out the real value of aquatic products as food and urges the public to become better acquainted with their merits.

Use potatoes to save wheat (*U. S. Dept. Agr., Office Sec. Circ. 106 (1918), pp. 6*).—This circular, consisting mainly of recipes, tells especially how to use potatoes in place of flour.

The Girasole or Jerusalem artichoke, a neglected source of food, T. D. A. COCKERELL (*Sci. Mo., 6 (1918), No. 3, pp. 260-269*).—The origin and cultivation of the Jerusalem artichoke and its possibilities as human food are here discussed. Directions for cooking are given.

The bread supply of Fargo, R. E. REMINGTON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 1, pp. 14-16*).—Attention is called to the great variation in weight of the loaves sold by bakeries in Fargo, N. Dak. Individual loaves from the same baking and selling for the same price were found to vary in weight from

15 to 18 per cent. The average weight of the 10-ct. loaf was proportionately higher than for the 15-ct. loaf in all bakeries. Analyses of the various samples are reported.

Baking experiments with so-called egg substitutes (*Bul. Kans. Bd. Health, 14 (1918), No. 3, pp. 36, 37*).—In experiments made with several so-called egg substitutes it was found that a true sponge cake, one in which no baking powder is used, can not be made by substituting half the number of eggs with the commercial egg substitutes tested.

It is pointed out that the average weight of the dried edible portion of a hen's egg is about 0.5 oz. A teaspoonful of most of the so-called egg substitutes, which the manufacturers claim to be equal to 1 egg in baking and cooking, weigh only about 0.1 oz., or one-fifth that of the dry matter of 1 egg.

Averaging the selling price of seven commercial egg substitutes, it is calculated that the consumer is paying more per pound for the substitutes than he would pay for the dry material of hen's eggs at 40 cts. per dozen. The substitutes are chiefly starch, 70 to 90 per cent, while the dried matter of eggs is essentially protein and fat. Analysis of one brand showed that while the claim was made that the contents of the package was equivalent to 12 eggs, on a basis of protein value it was equal to only 1.7 eggs, in fat value to 0.14 of 1 egg, and in fuel value to 2.6 eggs.

"It would seem that the manufacturers of many of these so-called egg substitutes are exploiting the names of highly valuable and high-priced food to further the sale of their product."

Sugars other than cane or beet, G. L. TELLER (*Amer. Food Jour., 13 (1918), No. 1, pp. 23, 24*).—The distribution in common food materials of sugars other than sucrose is here discussed. Only those sugars that are of commercial importance are mentioned—invert sugar, dextrose and levulose sugars, maltose, glucose, and lactose.

Milk from Fargo restaurants, E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 1, pp. 13, 14*).—Analyses of the milk served in some of the Fargo (N. Dak.) restaurants are reported.

[Miscellaneous analyses of food and drug products], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 1, pp. 18-20*).—Analyses are reported of an egg substitute of which 46.25 per cent consisted of starch and vegetable tissue, and of two proprietary drug preparations.

A comparison of the effects of breakfast, of no breakfast, and of caffeine on work in an athlete and a nonathlete, I. H. HYDE, C. B. ROOT, and H. CURT (*Amer. Jour. Physiol., 43 (1917), No. 3, pp. 371-394*).—Two subjects, one an athlete and the other a nonathlete, were observed and tests made of the pulse rate, blood pressure, ergographic, and ergometer work in both men under the following conditions: With certain doses of caffeine without breakfast, breakfast without caffeine, neither breakfast nor caffeine, and of different intervals of time following the partaking of caffeine or breakfast. Some of the results of the experiments recorded may be summarized as follows:

The ergographic work had practically no effect on blood pressure and only a slight effect, if any, on the pulse rate of either subject when working either without or after eating breakfast. The normal pulse rate was practically the same, but the normal blood pressure was higher at all times in the athlete than in the nonathlete.

The efficiency of both subjects grew in proportion to the interval between the meal and the beginning of work—from 1 to 2½ hours.

The increase above the normal blood pressure after working either with or without breakfast was the same for both subjects notwithstanding the

athlete did more work. Under the same conditions the pulse rate in the athlete was practically double that in the nonathlete. The increase in heart rate was least in both subjects when working 2½ hours after eating breakfast, that is, when the greatest amount of work was accomplished.

A weak dose of caffeine (1.42 grains), without work or breakfast, gradually increased the pulse rate during the first hour, but in the nonathlete, as a rule, only after a slight initial fall. In both subjects the pulse returned to normal rate within 3 hours. With a larger dose, 2.24 grains, under the same conditions, the increase in pulse appeared more promptly, but in 30 minutes was depressed below normal in the nonathlete and accelerated above the normal rate in the athlete. The blood pressure rose above the normal level in 1 hour and frequently had not returned to the level in 3 hours after taking either of the doses of caffeine.

The effects of caffeine taken at different intervals before work varied with the dose and the individual. The athlete did little more work 45 minutes after than he did 20 minutes before taking the drug. The nonathlete did two and one-half times as much work 3 hours after as he did 20 minutes after taking the dose.

Power and endurance for work and cardiac activity and increase in blood pressure did not keep pace with increase of dosage. The maximum power for work in both subjects was attained with the dose of 2.24 grains of caffeine. With this dose both subjects did two and one-half times as much work as they were able to do 1 hour after eating breakfast.

A stronger dose of 3.58 grains depressed the muscular power for work in both men, but very markedly so as well as the blood pressure and pulse rate in the nonathlete. In the athlete the blood pressure was no different but the heart rate was less after the work following the weaker dose.

When the dose was given in proportion to body weight, 0.2 grain of caffeine per 9.3 kg. of body weight or a stronger dose of 0.2 gm. per 5.9 kg. weight, the weaker dose stimulated the working power the more, but in the nonathlete the reverse was the case. It was found that for each subject there was a definite optimum dose, which when increased proved depressing for muscular work, blood pressure, and pulse rate.

One hour's rest did not remove the sense of fatigue produced by ergometer work, but when caffeine was taken the fatigue of the previous hour's work was inhibited and both subjects did more work then and even 24 hours after taking the caffeine than they did before taking the drug.

Increased irritability was noticed with the large dose of caffeine.

The influence of thyroid feeding upon carbohydrate metabolism, S. KURIYAMA (*Amer. Jour. Physiol.*, 43 (1917), No. 4, pp. 481-496).—Thyroid feeding experiments were made upon laboratory animals (rats and rabbits) to determine the influence upon carbohydrate metabolism. The following results are given:

Fresh thyroid gland of pigs or the desiccated thyroid used, administered by mouth in doses of 3 to 5 gms. (fresh) or 0.5 to 1.7 gm. (desiccated) per day, "decreased the glycogen content of the liver of white rats distinctly in three to five days. Control animals, fed on the same diet with the addition of muscle tissue or egg, do not show any such change, even when the food amount is regulated so that they lose as much in body weight as the thyroid-fed animals. The influence of thyroid feeding upon liver glycogen can be very easily removed by omitting thyroid from the diet. The liver shows its normal glycogen content two or three days after the cessation of thyroid administration, even when the loss of body weight has not been regained. This phenomenon seems to show

that the changes resulting from thyroid feeding and causing the loss of liver glycogen are not of a serious morphological nature.

"When dextrose is introduced parenterally to fasted rats which show a very low glycogen content of the liver the amount of liver glycogen increases markedly in a few hours. This does not seem to be the case in the thyroid-fed rats. Experimental hyperthyroidism does not change the sugar content of the blood in either rats or rabbits. Spontaneous glycosuria does not result from thyroid feeding in either rats or rabbits. The tolerance of thyroid-fed rabbits for dextrose, parenterally administered, does not differ from that of normal animals. Nearly the same degree of hyperglycemia and glycosuria can be induced by epinephrine injection in thyroid-fed as in control rabbits. The adrenal gland of thyroid-fed rats contains approximately the same amount of epinephrine as that of normal rats."

A bibliography is appended.

Pellagra: Its nature and prevention, J. GOLDBERGER (*Pub. Health Rpts. [U. S.], 33 (1918), No. 14, pp. 481-488*).—In this paper the symptoms, cause, and cure of pellagra are discussed, and an attempt is made to answer, as simply as possible, the more important questions which the public frequently asks in regard to pellagra.

It is maintained that the right kind of a diet will keep people from having the disease and will cure those who have it if the cases are not too far advanced. In order that a proper balance may be assured, the diet should include, besides the cereals, starches, sweets, and fats, a sufficient quantity of milk or some lean meat and an abundance of green vegetables and fruit, and preferably some of all of these classes of foods.

ANIMAL PRODUCTION.

Values of commercial feeding stuffs based on the net energy, C. W. HOLDWAY (*Virginia Sta. Rpts. 1915-16, p. 200*).—Based on the net energy of different feeding stuffs as shown by Armsby (*E. S. R., 36, p. 367*), a table is given of comparative values of feeding stuffs. The table is intended to enable feeders of cows and beef animals to transform market quotations of feeding stuffs into comparative feeding values on a money basis, to choose the cheapest feeds from a number of quotations, and to determine when a farm crop can be sold and replaced with a cheaper feed. The table also shows the digestible true protein in the various feeding stuffs.

Fish wastes for feeding animals, J. M. BARTLETT (*Maine Sta. Bul. 266 (1917), pp. 291, 292*).—Results of analyses of raw and air-dried samples of fish wastes from sardine factories are tabulated. The samples show great variation in composition, due largely to difference in water content. When reduced to an air-dry condition, carrying approximately 10 per cent of water, the composition was more uniform. On this basis the samples showed from 43.93 to 51.19 per cent of protein and 13.83 to 24.15 per cent of fat, but the oil content was too high to be safe for feeding except in small quantities. It is stated that fish meal containing only 2 to 4 per cent of oil and 3 per cent of salt can be safely fed, but larger amounts of oil may cause a fishy taste in the meat products. The phosphate of lime found in fish meal is deemed a valuable adjunct in feeding animals.

Commercial feeding stuffs, R. O. BAIRD (*North Dakota Sta. Spec. Bul., 5 (1918), No. 1, pp. 1-12*).—Information is given concerning the ingredients guaranteed and the mineral content and other constituents identified in the examination of a number of live-stock and poultry tonics. Tabulated analyses are also reported for a number of feeding stuffs, including meat scrap, meat meal, tankage, linseed meal, cottonseed meal, and mixed and proprietary feeds.

The feeding-stuffs control law and how to comply with it, E. G. PROULX (*Indiana Sta. Circ. 75 (1917), pp. 8*).—This circular gives the full text of the Indiana feeding-stuffs law as passed in 1907 and amended in 1909. The law is discussed and information given on its administration and the regulations of the State chemist's office covering the sale of concentrated commercial feeding stuffs.

[Sorghum for live stock], C. C. CUNNINGHAM and R. KENNEY (*Kansas Sta. Bul. 218 (1917), pp. 48-52*).—The average composition of sweet and grain sorghum seed is tabulated and compared with that of corn and corn-and-cob meal. In a feeding test with five lots of 10 pigs each a comparison was made of Kafir corn, milo maize, feterita, kaoliang, and corn, the daily ration consisting of 4.9 lbs. of one of these ground grains supplemented with 2.3 lbs. of shorts and 0.4 lb. of tankage per head. On these feeds the daily gains per head were 1.4, 1.43, 1.36, 1.31, and 1.46 lbs., respectively; and the concentrates required per pound of gain, 5.34, 5.23, 5.49, 5.72, and 5.14 lbs., respectively. In two other tests with pigs sweet sorghum seed proved decidedly inferior to corn, Kafir corn, and milo maize. The feeding value of the three latter grains varied but slightly.

Corn and Kafir corn were compared in fattening lots of 15 calves each. On 11.4 lbs. of corn, 1.79 lbs. of cottonseed meal, and 17.05 lbs. of sorghum silage, and 4.5 lbs. of alfalfa hay for two months of the 180 days' test, one lot of the calves gained an average of 1.96 lbs. per head daily and required 6.74 lbs. of concentrates per pound of gain. In the other lot, on the above ration, except that an equal weight of Kafir corn replaced the corn, the calves gained an average of 1.74 lbs. per head daily and required 7.63 lbs. of concentrates per pound of gain.

For fattening lambs 0.8 lb. of shelled corn, supplemented with 0.19 lb. of cottonseed meal, 1.36 lbs. of alfalfa hay, and 1.09 lbs. of sweet sorghum silage produced an average of 0.4 lb. of gain per head daily and required 2.69 lbs. of concentrates per pound of gain. When 0.9 lb. of shelled Kafir corn replaced the corn in the above ration the lambs gained 0.34 lb. per head daily and required 3.08 lbs. of concentrates per pound of gain. A third lot, fed 0.9 lb. of Kafir-corn meal and the above supplements, gained an average of 0.36 lb. daily and required 3.03 lbs. of concentrates per pound of gain.

In two tests in which corn and sweet sorghum silage were compared as a feed for dairy cows, the former produced 3 per cent more milk and 1 per cent more milk fat than the latter.

During 1912, 1913, and 1914 corn silage, Kafir-corn silage, and sweet sorghum silage were compared for the maintenance of calves. In addition to the silage the rations consisted of 1 lb. of cottonseed meal in 1912 and 1914 and 1 lb. each of corn and linseed meal in 1913. The average daily gains were 1.15 lbs. on corn silage, 1.25 lbs. on Kafir-corn silage, and 1.08 lbs. on sweet sorghum silage. It is stated that the above seasons were more favorable for the production of sorghum than for corn.

New facts on feeding cattle for successful growth and reproduction, E. B. HART, H. STEENBOCK, and G. C. HUMPHREY (*Wisconsin Sta. Bul. 287 (1918), pp. 3-24, figs. 20*).—A summary is given of experiments which have been noted from other sources (E. S. R., 33, p. 367; 37, p. 766) on the effect that rations balanced from restricted sources may have upon growth and reproduction in cattle. The results of the station's recent work along this line in nutrition are discussed in their bearing upon the prevailing theory of balanced rations.

It has been shown that a ration made from the corn plant will be found safe in every respect for a growing and reproducing heifer. On the other hand,

the wheat plant can not be relied upon to furnish adequately the nutrients needed for such an animal. The mineral content of the straw will in all likelihood be too low in quantity. In addition, the grain carries a toxic material tending to pull the animal down. Wheat grain and wheat straw can be fed with alfalfa hay or corn stover and probably other good roughages, such as clover hay, thereby supplying the mineral deficiency and at the same time aiding greatly in overcoming the toxic effect of the wheat grain. Rations made wholly from the oat plant will be incomplete, and the offspring produced by the continued use of such a ration will be dead or weak. The straw is the disturbing factor, furnishing in most cases an inadequate mineral mixture. Mixed with some corn stover or legume hay the ration will be wholly sound for the production of strong calves. When the production of weak offspring through improper rations exists, the use of good roughages will solve the problem.

"The necessity of considering such factors as toxicity, suitable proteins, growth-promoting substances or vitamins, and a proper balance of salts indicates how complex the problem of nutrition really is and how necessary it is that the relative importance of the factors be clearly exposed in order that we may place the various feeds in their proper category."

Raising beef cattle, B. O. SEVEASON (*Pennsylvania Sta. Bul. 150 (1918), pp. 3-19, figs. 11*).—A summary is given of work from November, 1914, to July, 1917, of the investigations under way at the station on the feeding and management of beef-breeding herds under Pennsylvania conditions (E. S. R., 35, p. 168). During this period 20 pure-bred cows were used, lot 1 consisting of 10 Shorthorns and lot 2 of 10 Aberdeen Angus. The object was not to make a breed comparison, but to have representatives of a standard breed of beef type. During the summer the cows, calves, and growing stock were pastured without extra feed. During the winter corn silage was the sole roughage of the cows and growing cattle. In addition, the cows in lot 1 were fed 1 lb. of linseed meal per head daily, and those in lot 2, 1 lb. of cottonseed meal. All growing calves designed for breeding were fed silage and 3 lbs. of cottonseed meal per 1,000 lbs. live weight. Fattening stock was fed corn meal and mixed hay or alfalfa hay in addition to corn silage and cottonseed meal.

During the three winters, 1914, 1915, and 1916, in a basement barn with the south side removed, the cows in lot 1 lost an average of 29.84 lbs. each per winter, and were wintered at an average net cost of \$22.97. The cows in lot 2 lost an average of 8.12 lbs., and were wintered at a cost of \$23.23. During the summers of 1915 and 1916 the cows were pastured an average of 210 days. Those in lot 1 gained 67.11 lbs. each per summer, and those in lot 2, 73.31 lbs. The average weight of calves supported per cow on pasture was 240.31 lbs. for lot 1 and 360.53 lbs. for lot 2. The total annual cost of maintenance per cow was \$42.31 for lot 1 and \$43.04 for lot 2. The annual feed cost for a pure-bred herd bull was \$63.63.

It is stated that during the five and a half years of the experiment the selection of breeding animals on the basis of growth of calves, regularity of breeding, milking tendencies, appetites, feed capacity, and other utility characteristics and the use of a pure-bred sire resulted in marked improvement. Both lots have produced 100 per cent of calves during the last two years. The Shorthorn calves were 2.05 lbs. heavier at birth than the Aberdeen Angus calves, and spring calves averaged about 10 lbs. heavier than fall calves. In both lots male calves were slightly heavier than female calves. The calves at weaning time (9 months) averaged 532.46 lbs. in weight for lot 1 and 504.81 lbs. for lot 2. On the basis of 100 per cent calves raised the cost per calf at weaning was \$43.75 for lot 1 and \$45.40 for lot 2.

A lot of 23 weaned growing heifers made an average daily gain of 1.221 lbs. per head during the winter on corn silage and 3 lbs. of cottonseed meal per 1,000 lbs. of live weight. On the same ration the winter gains of a lot of 18 bred heifers averaged 1.079 lbs. per head. On pasture 12 growing heifers gained a daily average of 0.502 lb. per head during the summer period, while 3 bred heifers lost 0.161 lb. per head daily. The annual cost of keeping the growing heifers was \$21.09, and of the bred heifers \$30.59. On the above rations heifers made satisfactory development and growth in winter quarters and produced normal calves. The cost of raising heifers to 30 months of age was \$81.61 for calves born September 1, and \$90.99 for calves born March 1.

In fattening tests it was found that calves weighing less than 550 lbs. are not so profitable as heavier calves because of the longer period of time required to put them into the desired market condition. On the whole the investigations show that calves dropped in the fall of the year and fattened after weaning at 9 months of age, while on pasture and during the early winter, are more profitable than spring calves raised and fattened as baby bees during the following winter.

Wintering mature brood sows, W. P. SNYDER (*Nebraska Sta. Bul. 162 (1917), pp. 3-29, fig. 1*).—During seven winters 20 or more brood sows that had produced at least one litter were wintered on alfalfa or a mixture of alfalfa and corn. The alfalfa was fed as hay, as chopped hay, and as chopped hay stewed or boiled in water.

From the trials the conclusion is reached that old sows may be cheaply wintered on alfalfa hay alone, provided it is of good quality. More satisfactory results, however, are probable when some grain in addition is fed. A ration of alfalfa hay in the rack and 1 per cent of the weight of the sows in shelled corn in the trough proved satisfactory and reasonably low in cost. On this ration sows were wintered at a cost of \$5.29 each, while on a ration of chopped alfalfa hay and ground grain, 1:1, the cost was \$6.92. The use of self-feeders and a ration of chopped alfalfa and chopped corn, 3:1, was also satisfactory.

Alfalfa silage did not appear to be a suitable feed for hogs, nor was there any advantage derived from stewed alfalfa compared with alfalfa hay. When the price of alfalfa approaches that of corn the compelling of its consumption in large amounts is deemed of doubtful value.

Pork production in Nebraska, E. A. BURNETT (*Nebraska Sta. Circ. 4 (1917), pp. 7*).—Suggestions are given for the production of pork under present conditions, emphasis being placed upon the utilization of pasture and by-products to supplement high-priced grain.

Stallion enrollment.—VII, Report of stallion enrollment work for the year 1917 with lists of stallions and jacks enrolled, H. E. MCCARTNEY (*Indiana Sta. Circ. 73 (1918), pp. 120*).—There were enrolled during the year 5,454 stallions and jacks. This is a decrease of 470 as compared with the previous year and represents the elimination largely of grades and scrubs. The number of mares bred was much smaller than in the previous year, apparently because of a greater proportionate increase in the values of cattle and hogs.

Licensed stallions in Utah during the season of 1917, W. E. CARROLL (*Utah Sta. Circ. 27 (1917), pp. 3-29*).—The distribution of licensed stallions by breeds and counties, the number of licensed animals in each county, and the distribution of the breeds of stallions in the State are shown in tables. Of the 400 animals licensed during the year there were 248 of the draft breeds, 34 of the light breeds, 1 jack, and 117 grades.

American jack stock and mule production, W. S. ANDERSON and J. J. HOOPER (*Kentucky Sta. Bul. 212 (1917), pp. 235-304, figs. 28*).—This is a contribution to the history of jack breeding in the United States. The influence that certain great sires have had upon the upbuilding of the American jack breed of domestic asses is pointed out, and tabulated pedigrees are given of a number of noted jacks. A plea is made for the standardization in size and type of jack stock, and suggestions are given for the breeding, selection, care, and judging of jacks and jennets, including a classification of jacks and jennets for fairs and a score card for jacks. A few common diseases of jacks are noted, with directions for their control. Notes on mule production, the future demand for mules, and the characteristics of brood mares for mule production are included.

The chemical composition of green sprouted oats, J. M. BARTLETT (*Maine Sta. Bul. 266 (1917), pp. 285-290*).—Methods used by the station in sprouting oats for poultry feeding are outlined. Analyses of sprouted oats were made at different stages of growth, and the nutritive value of sprouted oats was compared with unsprouted oats.

The results show that the sprouted oats at the proper stage to feed (from 3 to 4 in. high) contain about 77 per cent water, 2.8 per cent protein, 3 per cent crude fiber, 1.3 per cent fat, and 16 per cent nitrogen-free extract. There is an actual loss of dry matter in sprouting oats, consequently the only advantage of the process is the production of succulent green feed when grass and other green feeds are not available.

Hens should observe all wheatless days (*Mo. Bul. Ohio Sta. 3 (1918), No. 3, p. 96*).—Of 50 pullets fed 24 weeks a ration of wheat supplemented with a small amount of bran, meat scrap, and linseed meal, 21 died. Only 1 pullet died within the next 28 weeks, when corn was fed instead of wheat in the mixture. Only 2 hens died in the year in the lot fed mainly corn with no wheat. Egg production decreased as the proportionate quantity of wheat fed in rations to four lots increased. Hens fed corn, with a small quantity of bran, meat scrap, and linseed meal, laid 58 per cent more eggs than hens fed a similar ration except that wheat replaced corn. The addition of wheat in the mixture fed in this experiment decreased the amount and increased the cost of egg production.

Pigmentation and other criteria for the selection of laying hens, A. F. BLAKESLEE, J. A. HARRIS, D. E. WARNER, and W. F. KIRKPATRICK (*Connecticut Storrs Sta. Bul. 92 (1917), pp. 93-194, figs. 23*).—The data upon which this study is based were drawn from the egg-laying contests conducted for the past five years at the Storrs Station. A biometric analysis of the correlation between ear lobe pigmentation and egg production in White Leghorn hens is made of data already noted (*E. S. R., 38, p. 276*). An analysis was also made of the relation of laying to pigment changes in beak, vent, legs, and comb and to condition of feathers due to molting. The breeds used as the basis of this analysis were Leghorns, Plymouth Rocks, Wyandottes, and Rhode Island Reds.

It was found that as a bird commences to lay the yellow color disappears from the ear lobes (in the Leghorns), the vent, the beak, and the legs, apparently in the order named. The legs are the last of the parts mentioned to lose yellow pigment after laying begins, and are the last to regain the yellow when laying ceases. The grade of color in the ear lobes, vent, and beak are indicators of the laying activity in the relatively immediate past, while the legs are indicative of laying activity in the more distant past. The greater the amount of yellow, the less active has been the laying.

Records taken in July, September, and October indicate that October, at the end of the pullet year, is in general the best time in which to use the color test in selecting superior layers. In October the value of the comb and the condition

of the feathers as regards molting was also tested as possible criteria for laying. Birds with large bright combs have been better layers than those with dull, shriveled combs. Birds that have not molted till late have been better layers than those that molted earlier.

Of all the characters graded for yellow pigment, the vent averaged the best criterion in October for selecting the high producers, while the legs averaged the best for picking out the low producers. Of all the characters studied, the condition of feathers in relation to molting averaged the best for selecting high producers. The hens were also selected on the basis of condition of feathers in combination with the best pigment test. In all cases the group of birds with pale vents that had failed to molt when the records were taken had a distinctly higher yearly average egg production than that given by any single criterion. This combination was also the best in all cases for picking out the low producers.

The bulletin closes with a discussion, the essential points of which have already been noted (E. S. R., 33, p. 172), of the basis upon which poultry shows are conducted, with suggestions of ways in which the ideals of the fancier may be changed to meet those of the utility breeder.

Conserving the baby chicks, W. C. THOMPSON (*New Jersey Sta. Hints to Poultrymen*, 6 (1918), No. 6, pp. 4).—Brief notes are given on the selection and care of eggs for incubation, the care of chicks in the incubator and brooder, and the feeding of baby chicks.

War chicks, Mrs. G. R. SHOUP (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 5 (1918), No. 12, pp. 183-188).—Combinations of grains and mashes are given, together with detailed directions for feeding and managing chicks in brooders on a wheatless diet.

DAIRY FARMING—DAIRYING.

The effects of high protein and high energy rations in feeding dairy cows.—I, Effects on the utilization of the rations, W. B. ELLETT and C. W. HOLDAWAY (*Virginia Sta. Tech. Bul* 12 (1917), pp. 29-45; *Rpts.* 1915-16, pp. 29-45).—Feeding and digestion experiments are reported involving two lots of two Holstein cows each, weighing from 1,000 to 1,050 lbs. One lot was fed a high energy ration with a nutritive ratio of 1:11 and consisting of 9 lbs. of corn meal, 2 lbs. of bran, and 40 lbs. of silage. The other lot was fed a high protein ration with a nutritive ratio of 1:24 and consisting of 2 lbs. of cottonseed meal, 2 lbs. of bran, 7 lbs. of gluten meal, and 40 lbs. of silage. The experiment was started in 1913, and since September, 1915, the cows have been fed the above rations continuously. Tabulated data show the composition of the different feeds used and the amount of feeds and food constituents actually fed. From these it is seen that the high energy ration supplied an excess of energy and barely enough protein and the high protein ration an excess of protein and barely enough energy to meet the needs of the cows as calculated from average digestion factors.

A 10-day digestion trial was conducted with one cow of each lot, beginning April 24, 1916. On this date the high energy cow was at her minimum weight, 890 lbs., and the high protein cow weighed 1,057 lbs. From tabulated results of this digestion trial it is concluded that "the cow fed the high energy ration consumed almost all of her food and in so doing obtained a large surplus of energy. Her ability to digest the nutrients decreased until the energy dropped to the requirements of her body for maintenance and milk production. Then this decrease in digestibility stopped. The digestibility of the protein decreased 47 per cent, hence the cow was unable to maintain her flesh and decreased in

weight rapidly. The reduction in digestibility affected the fiber more than any other nonnitrogenous nutrient. The reduction for fiber was 54 per cent, for nitrogen-free extract 24 per cent, and for fat 19 per cent. . . .

"The high-protein cow refused 25 per cent of her ration, but the amount consumed supplied her with sufficient energy and two and one-half times as much protein as was necessary, and this excess protein was digested. The digestibility of the nutrients agreed closely with the average coefficients. These results show that a cow disposes of an excess amount of digestible protein by digesting it and voiding the excess nitrogen in her urine. When surplus energy is contained in the nutrients consumed the digestibility of the ration is lowered until the net energy is balanced to the needs of the animal. The maintenance requirement of the high energy cow for protein is shown to be at least 0.31 lb. daily. . . .

"The long-continued diminution in weight due to lack of protein on one hand and the gaining in weight due to excess of protein on the other hand indicate a considerable difference in the amounts of nitrogenous material that can be stored up in the mature ruminant's body. The high protein ration seemed to favor the production of a large quantity of milk fat from substances other than food fat. The food fat exactly balanced the milk and feces fat with the cow fed the high energy ration."

These results emphasize the importance of determining the effects of dissimilar rations in feeding experiments. It is indicated that, due to differences in digestibility of nutrients, both high protein and high energy rations give results that introduce inaccuracies in feeding investigations in almost every phase of the work.

Experiments with calf meals, O. F. HUNZIKER (*Indiana Sta. Rpt. 1917, pp. 27, 28*).—In testing calf meals as substitutes for milk for dairy calves five mixtures were fed for a period of 180 days to 25 calves divided into five lots of 5 calves each. The meals were fed in connection with milk, alfalfa hay, and a dry mash of ground corn and oats. The meal mixtures were as follows: Lot 1, the same as that fed lot 2 in a previous experiment (*E. S. R., 36, p. 565*); lot 2, soy bean meal, cottonseed meal, wheat middlings, and linseed meal, equal parts by weight; lot 3, blood flour, hominy feed, and wheat bran, equal parts by weight; lot 4, black albumin, wheat middlings, soy bean meal, and linseed meal (2:4:5:5); and lot 5, the same as No. 1 except that skim milk replaced whole milk. The protein content of these meals was 33.50, 28.73, 33.97, 34.44, and 33.59 per cent, respectively.

It required 3.63 lbs. of whole milk per head daily, in addition to ration No. 1, to produce a gain of 1 lb. per day. Ration No. 2 (vegetable protein) required 2.71 lbs. of whole milk in addition to the meal to yield a body gain of 0.73 lb. daily, while ration No. 3 (animal protein) yielded a body gain of 0.8 lb. daily through the use of 1.54 lbs. of milk in addition to the calf meal fed. Ration No. 4 produced a fair gain in body weight but required an excess of whole milk, due to the extreme laxativeness of certain ingredients in the meal. Ration No. 5 produced a daily gain of 0.91 lb. and required but 0.35 lb. of whole milk in connection with 3.25 lbs. of skim milk.

Dairy calves for veal, G. H. TRUE and C. V. CASTLE (*California Sta. Circ. 196 (1918), pp. 7*).—Notes are given on market classification for veal calves and factors determining whether it is profitable to feed dairy calves for veal, together with an outline of feeding practices.

The number of bacteria in milk, J. D. BREW and W. D. DOTTERER (*New York State Sta. Bul. 439 (1917), pp. 479-522*).—In continuation of earlier work (*E. S. R., 31, p. 78*) a report is given on 643 cooperative counts made by both

the plate and microscopic methods with fresh, unpasteurized market milk from the Geneva city milk supply. The microscopic counts were made in two ways, namely, counts of individual bacteria and counts of "groups" of bacteria.

Of the 643 comparative counts, 175 were higher by the plate count than by the individual count and 123 were lower by the plate count than by the group count. In 345 samples the plate counts were higher than the group counts and lower than the individual counts. All but 32 of the instances in which the plate counts were higher than the individual counts occurred in samples of less than 30,000 bacteria per cubic centimeter. The next class of 123 samples was evenly distributed throughout the series of counts, and the discrepancies are thought to be due either to the presence of living bacteria which did not grow on agar or to the presence of dead bacteria in a stainable condition. However, large numbers of dead bacteria in unpasteurized milk are the exception rather than the rule. If the 200 counts made of samples containing less than 30,000 bacteria per cubic centimeter are excluded, the plate counts are intermediate between the two microscopic counts in 71 per cent of the remaining 443 counts.

It is noted that the plate count probably represents fairly well the number of groups of bacteria in the milk after they are broken apart in the dilution waters; the group count, the number of groups of bacteria originally present in the milk; and the individual count, the number of bacteria actually present. A study was therefore made of the variation in size and compactness of the groups of bacteria originally present in milks of different grades. In general, the groups of bacteria were found to be of small average size in milk containing very few bacteria, and to increase in size as the number of bacteria increases, reaching an average size of from 12 to 14 individuals in milk containing about 1,000,000 bacteria per cubic centimeter, and diminishing in size as the number of bacteria becomes greater than this. Data obtained indirectly indicate that the average clump of bacteria in market milk breaks apart 2.6 times in preparing dilution samples. In 24 instances out of 345 the clumps broke into seven or more groups each, and in one instance the resulting number of groups was 16.5 times the original number. "The actual number of bacteria in milk is usually greatly in excess of the figure obtained by the plating method."

How bacteria in milk are counted, F. H. HALL (*New York State Sta. Bul.* 439, popular ed. (1917), pp. 11, figs. 2).—A popular edition of the above.

What is meant by "quality" in milk, R. S. BREED, H. A. HARDING, W. A. STOCKING, JR., and E. G. HASTINGS (*New York State Sta. Bul.* 438 (1917), pp. 459-475).—This report was also issued as Illinois Station Circular 205, from which it has been noted (E. S. R., 33, p. 479).

Composite v. one-day sampling of milk for the Babcock test, W. H. EATON (*North Carolina Sta. Bul.* 240 (1918), pp. 3-8, figs. 2).—In order to determine the accuracy possible in estimating the milk fat production of cows from samples taken from one day's milking during each month a test was made with 12 cows during a period of 90 days. At the end of each month of the experiment the milk fat production was estimated for each cow by the one-day-per-month method and by the composite method of sampling. By the composite method samples were taken from each milking of all the cows on test, and the fat yield calculated from weekly tests of these composite samples.

It was found that the three months' yield of the 12 cows as estimated by the one-day-per-month method was 786.36 lbs. of fat, and by the composite-sample method, 717.51 lbs., or a difference in fat production of 1.91 lbs. per cow per month.

Keeping qualities of butter.—IV, Cream ripening and its influence.—Bacteria in cream, their numbers and types and their itinerary in the manufacture of butter, C. W. BROWN and K. PEISER (*Michigan Sta. Tech. Bul.* 29 (1916), pp. 7-20, figs. 3).—This number of the series of contributions on the keeping qualities of butter (E. S. R., 22, p. 482) deals with the bacteria in cream relative to the numerical count and prevailing types, and traces these types through the different steps in the manufacture of butter. The cream used in the study was obtained from dairymen in the vicinity of the station. It contained about 30 per cent fat and averaged 0.43 per cent acidity. The acidity of the ripened cream averaged about 0.5 per cent. The acidity of the butter was about 0.2 per cent, and remained practically constant from time of drawing the buttermilk to 30 days later.

The microorganisms in the butter were for the most part those that were in the cream. Neither the buttermilk nor the freshly churned butter contained per unit volume as many living bacteria as the ripened cream. An average of about 30 per cent of the bacteria living in ripened cream failed to grow after the mechanical agitation in the churn. The process of washing and salting removed about 50 per cent of the microorganisms from the unsalted butter. Positive tests for peroxidase and reductase were obtained in the cream and in the butter, but not in the starter, in the ripened cream, or in the buttermilk. The negative results are thought to be due to a temporary inactivation by high acidity.

Bacterium lactis acidi predominated throughout the manufacture of butter. Other organisms appearing frequently were *Micrococcus lactis varians*, *M. lactis aureus*, *M. lactis albidus*, *Streptococcus lactis fulvus*, *Bacterium lactis album*, *Bacillus coli*, torulæ (liquefying and nonliquefying), and *Oöspora lactis*.

The more important literature is reviewed and listed.

Keeping qualities of butter.—V, Pasteurization and its influence.—A study of the factors which influence the resistance of lactic acid bacteria to heat, C. W. BROWN and K. PEISER (*Michigan Sta. Tech. Bul.* 30 (1916), pp. 7-18).—A continuation of the work noted above. The work here reported, a preliminary account of which has been noted (E. S. R., 33, p. 675), was undertaken to ascertain whether lactic acid bacteria in milk and cream survive pasteurization at a temperature commonly considered as efficient, and whether such survival is due to an inherent property of the organism or due to some external protection exerted by the constituents of the milk.

The temperature of the cream during pasteurization by the holding process in the pasteurizer (with coil rotating) used in these experiments was found to be almost constant throughout the whole mass. The thermal death point of some of the nonspore-bearing bacteria isolated from pasteurized milk and cream was higher than the pasteurization temperature (145° F., held for 20 minutes), while many had a thermal death point below the temperature of pasteurization. The thermal death point of a culture of *Bacterium lactis acidi* and of a culture of *Bacillus coli* was compared in bouillon and in four divisions of a sample of sterile milk. It was found that whey raised the thermal death point from 2 to 4° C., separated milk from 4 to 6°, whole milk about 8°, and cream from 12 to 14°. The addition of small amounts of lactic acid to a milk suspension of bacteria did not change their thermal death point.

Some of the factors affecting the heat resistance of bacteria in milk are discussed.

The more important literature is briefly reviewed and listed.

Protein hydrolysis in fresh and stored butter made from raw and pasteurized cream, O. F. HUNZIKER (*Indiana Sta. Rpt.* 1917, pp. 35, 36).—In additional experiments upon the protein hydrolysis in butter during storage (E. S.

R., 36, p. 772) nine lots of butter churned from three separate gatherings of cream were used. The butter was made from unpasteurized cream, from cream pasteurized at 145° F. held for 20 minutes, and from cream pasteurized at 180° flash. The butter was analyzed when fresh and after 60 days storage at from 6 to 15°. The precipitants used were bromin, copper sulphate, and phosphotungstic acid. The nitrogen not precipitated by the phosphotungstic acid was also determined by the Van Slyke method for determining the aliphatic amino-acid groups.

Phosphotungstic acid gave the most uniform and concordant results. It was found that the change both in the Van Slyke amino nitrogen and nitrogen not precipitated by phosphotungstic acid was greatest in raw cream butter and considerably less in pasteurized cream butter.

VETERINARY MEDICINE.

Chemical pathology, H. G. WELLS (*Philadelphia and London: W. B. Saunders Co., 1918, 3. ed., rev. and enl., pp. 707*).—In the revision of this book for the third edition (E. S. R., 32, p. 78) several subjects have been rewritten, especially gout, specificity of immunological reactions, anaphylaxis, icterus, acidosis, diabetes, and uremia. New sections have been added on the Abderhalden reaction, specificity, chemical bases of growth, atrophy, and the pressor bases. R. T. Woodyatt has revised the chapter on diabetes, contributed by him to the second edition to include the recent contributions to carbohydrate metabolism obtained through his new method for accurately timed and measured intravenous injections.

Immunity and anaphylaxis, J. DANYSZ (*Jour. Infect. Diseases, 22 (1918), No. 5, pp. 427-456*).—This is a theoretical discussion of the subject, with an explanation of the nature and mechanism of the reactions which determine the different phases of the evolution of infectious diseases and pathological conditions caused by animal or vegetable proteins considered as normally toxic, by synthetic colloids such as arsenobenzene, and by proteins considered as nutritive on absorption after complete gastrointestinal digestion but which cause a state of anaphylaxis when absorbed by hypodermic, intravenous, or even intrarectal injections.

The author concludes that the pathological condition in infectious diseases is due to anaphylaxis which is an intracellular or intravascular indigestion, or a combination of both. Indigestion is the inability of the organism to rapidly transform colloidal antigens into crystalloids. If it is intravascular, the effect is immediate and rapid (anaphylactic shock). If intracellular, the disturbances and lesions which result are more or less slow in appearing and may continue for hours, days, or years (as in tuberculosis, leprosy, and syphilis) (chronic anaphylaxis).

A contribution to the theory of anaphylactic shock, J. L. KRITCHEWSKY (*Jour. Infect. Diseases, 22 (1918), No. 2, pp. 101-114, pl. 1*).—"The sap of a plant, *Cotyledon scheideckeri*, which is able to precipitate animal serum and to agglutinate and cause lysis of red blood corpuscles, has the power to provoke the symptoms and the anatomic changes characteristic for anaphylactic shock when introduced into the veins of animals. The injection of the *Cotyledon* fluid under the skin of animals provokes phenomena identical with the local anaphylaxis, known as Arthus' phenomenon. When deprived of all precipitating and agglutinating substances, the fluid is quite harmless for animals. The shock and the death after injection of the *Cotyledon* fluid are due to change in the degree of the disperseness of the plasma colloids.

"In anaphylactic shock in immunized animals immune bodies cause the same change in the degree of disperseness in vitro substances in the Cotyledon juice which I examined; it is, therefore, quite natural to suppose that the shock observed in anaphylaxis and related processes just as the shock studied in the present investigations is due to change in the degree of disperseness of the plasma colloids of the blood. On this account one may regard all these processes—and others, showing analogous, clinical, and anatomic changes—as morbid processes caused by a change of degree of disperseness of the blood plasma."

The rôle of specific fats in complement fixation, C. C. WARDEN (*Jour. Infect. Diseases*, 22 (1918), No. 2, pp. 133-141).—"The value of antigens in serum tests for the presence of antibody in gonorrhea, syphilis, typhoid fever, and cholera appears to depend on fatty complexes of definite chemical arrangement or configuration which represent the fatty content of the several micro-organisms causing those diseases. The reactions of the test are surface reactions and depend on the physical state of the antigen. The serum test as applied to tuberculosis is fallacious and unreliable, probably because of the absence of sensitizers in the serums."

Antiseptics, T. RETTIE (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 2, pp. 23 T-26 T; *Sci. Amer. Sup.*, 85 (1918), No. 2204, pp. 202, 203; *abs. in Chem. Abs.*, 12 (1918), No. 10, p. 1092).—This article reports the results of a study by the author, in cooperation with A. M. Drennan and W. Campbell, of the efficacy of the common antiseptics in use at the time of the investigation at the military hospitals in Edinburgh and describes the preparation and method of application of "Eupad" and "Eusol." The former is a powder consisting of equal weights of chlorid of lime and boric acid. Eusol is prepared by shaking up 25 gm. of Eupad in a liter of water and filtering off the sediment. In Eusol it is claimed that "the full value of hypochlorous acid is available without the drawbacks inherent in the earlier solutions containing this potent reagent."

The disinfecting power of periodol, G. SAMPIETRO (*Ann. Ig. [Rome]*, 27 (1917), No. 4, pp. 236-246; *abs. in Abs. Bact.*, 1 (1917), No. 6, pp. 542, 543).—Researches are reported on the sterilizing power of periodol, a new disinfecting agent composed principally of iodine and chlorin. It decomposes rapidly in water, liberating oxygen, chlorin, and iodine. Tests with organisms most likely to contaminate drinking water, such as cholera vibrio, *B. typhosus*, *B. dysenteriae*, *B. diphtheriae*, *Staphylococcus pyogenes aureus*, and *Streptococcus pyogenes*, show that at a dilution of 1:50,000 a fresh solution of the periodol has very effective disinfecting action. At this concentration it does not produce any changes in taste or odor and is harmless to the human organism. It may also be used as a disinfectant for the oral and nasal cavities at a dilution of 1:1,000.

Brilliant green as a bactericidal agent for the purification of vaccine virus, C. KRUMWIEDE, JR., F. S. FIELDER, and T. A. WATSON (*Jour. Infect. Diseases*, 22 (1918), No. 2, pp. 118-124, fig. 1).—"Brilliant green in a concentration of 1:10,000 has no appreciable effect on the potency of vaccine virus. This amount of dye when used in combination with the glycerol-carbolic solution usually employed markedly hastens the rate of reduction of the bacterial content, rendering most preparations bacterially sterile in from two to four weeks.

"Although the dye can not be relied on to kill tetanus spores, should they be present no difficulty should be encountered in demonstrating their presence after the associated bacteria are destroyed. The results obtained warrant its practical application to vaccine virus for general distribution, or at least in emergencies when the virus must be employed shortly after collection from the calf. The use of brilliant green gives a simple method hitherto not available for obtaining a bacteriologically sterile but fully potent virus for experimental purposes."

Report of the veterinary department, R. A. CRAIG (*Indiana Sta. Rpt. 1917*, pp. 61-67).—The agglutination test for infectious abortion of cattle was made on 226 blood samples and 46 milk samples. Where the milk and blood samples from the same animal were compared, the blood showed a higher percentage of reactions to the agglutination test.

In post-mortem findings of hemorrhagic septicemia of cattle, the most prominent lesion was a hemorrhagic inflammation of the anterior air passages, indicating that dust may be a carrier of the infection. The use of hemorrhagic septicemia bacterin in a herd in which four cases with two deaths from the disease had occurred apparently checked the disease.

Experimental work with hog cholera has been noted from another source (E. S. R., 38, p. 688).

Annual report of director of veterinary research, 1915-16, A. THEILER (*Union So. Africa Dept. Agr. Rpt. 1916*, pp. 45-49).—This, the usual annual report, relates to research work carried on during 1915-16 (E. S. R., 35, p. 678).

Experiments are reported in which bots that were taken from the stomach of a horse dead of pernicious anemia produced the disease when emulsified and injected into a susceptible horse. Bots from a healthy horse did not produce the disease, thus disproving the claim of the Seyderhelms that pernicious anemia is produced through this agency (E. S. R., 35, p. 80).

The spinose ear tick (*Ornithodoros megnini*), first found to occur in South Africa in 1912, is reported to be responsible for a considerable amount of injury to sheep, goats, and calves.

Annual report of the imperial bacteriologist for the year ending March 31, 1917, A. L. SHEATHER (*Ann. Rpt. Imperial Bact. [India], 1917*, pp. 25).—This is the usual annual report in which data are given on the preparation and use of serums and vaccines for rinderpest, anthrax, hemorrhagic septicemia, etc.

The treatment of epizootic lymphangitis (*Vet. Rev.*, 2 (1918), No. 1, pp. 26-28).—A review of recent literature.

The detection of John's disease by the use of "johnin," E. G. HASTINGS, B. A. BEACH, and F. B. HADLEY (*Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 4, pp. 462-466).—The authors report upon tests made of 43 animals of which 5 reacted and upon slaughter showed the lesions characteristic of John's disease. Four of the five showed marked temperature reactions to the intravenous injection of 10 cc. of johnin, while the physical condition of the fifth gave evidence that it was affected.

The prophylaxis of Malta fever by the active immunization of animal carriers of the organism, H. VINCENT (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 8, pp. 359-362).—Inoculation experiments are reported verifying the degree of immunity conferred on goats by the method of vaccination previously noted (E. S. R., 25, p. 336). The results show that vaccination produces a strong immunity which protects the animals against a large dose of living virus introduced under the skin, into the veins, or by way of the digestive tract.

Antirinderpest vaccinations by the simultaneous method of serum and of virulent blood from the point of view of their influence on malaria, J.-B. PIOT (*Bul. Union Agr. Égypte*, 15 (1917), No. 121, pp. 93-98).—Cases are reported which tend to prove that the hematzoal diseases of the blood of cattle are not transmitted following injections of blood employed as preventive inoculations against rinderpest. The experiences of the author in the immunization against rinderpest of 854 animals show that only 2 calves died of possible complications due to the vaccination and that only 2 cows succumbed to piroplasmiasis. The fact that a large number of animals vaccinated five years before have been in intimate and permanent contact with animals having

rinderpest without receiving the disease indicates that the immunity continues for at least five years after vaccination.

A new method of staining the tubercle bacillus, C. CÉPÈDE (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 8, pp. 357-359).—The method depends upon the differentiation of the alcohol-acid resisting Koch bacillus from other organisms which are not alcohol-acid resistant by the use of a counter stain with which the decolorized organic acid and alcohol have been combined. The counter stain, "methylene lactoblué or Cépède blue," is prepared by placing an excess of powdered methylene blue in a flask containing 40 cc. of lactic acid, 160 cc. of water, and 800 cc. of 95 per cent alcohol. Smears are prepared, fixed by heat, and stained with carbol-fuchsin in the usual way. They are then placed with or without washing in the lactoblué solution for two or three minutes, washed in water, and dried.

The advantages of this method of staining are said to be the precision and sharpness of coloration of the Koch bacillus, associated flora, and histological elements; a very appreciable economy of time; and accuracy of diagnosis. By means of it the organism may be detected in feces, urine, blood, and sputum.

Observations on complement fixation in tuberculosis, W. MEYER (*Med. Rec. [N. Y.]*, 93 (1918), No. 5, pp. 193, 194).—"Cases with tuberculous glands or bones showed a higher percentage in 4+ human type than pulmonary cases; this holds good also in bovine type, namely 2+ or simply 1+. The third stage cases (pulmonary type) that showed + were all early third-stage cases; all late third-stage cases were negative. Some cases were + one month and negative the next month or vice versa; these cases were all anemic, had lost weight, and complained of fatigue, but showed no signs of disease by X ray or other diagnostic methods. The leucic condition nowhere interfered with the tuberculosis deviation test, since those that reacted to both tests showed unmistakable signs of active tuberculosis.

"The biologically treated cases became negative in 82 per cent. A case showing 4+ human and 2+ bovine having been treated with a mixture of human and bovine tuberculin for three or four months, for instance, would under a new test show human + and bovine ± and be negative a few months later. Out of 89 pulmonary cases, 5 increased the + by one or two and the bovine, originally —, became + in one case after three months' treatment, but became — again under continued treatment; all other cases showed a continuous decrease in the + reaction."

The presence of a growth-producing substance in cultures of typhoid bacilli, A. J. P. PACINI and DOROTHY W. RUSSELL (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 43-49, figs. 4).—Growth experiments on rats are reported proving that "the typhoid bacillus, in growing, produces vitamin which can be isolated and identified by proper biological methods. The bearing on the effect of the same upon the general metabolism of typhoid patients, and indications of a scientific basis for new methods of feeding these cases, are under investigation."

Standardization of antityphoid vaccine, G. W. MCCOX (*Amer. Jour. Pub. Health*, 8 (1918), No. 4, pp. 299-301).—The technique employed at the Hygienic Laboratory, Washington, D. C., consists in inoculating rabbits with the vaccine in single doses of 2,500,000,000 organisms or in three doses at intervals of 24 hours, bleeding the animals after eight days, and testing the serum for agglutinating power with living Rawling culture suspended in physiological salt solution. The serum is used in varying dilutions of from 1:25 to 1:1,600 and is mixed with an equal volume of the suspension of the organism, shaken, and kept at 37° C. for an hour. A control test is made with a known satisfactory vaccine.

Abortion disease in cattle, L. VAN ES (*North Dakota Sta. Circ. 18 (1918), pp. 19*).—This is a review of the present status of knowledge of the disease and means for its control.

A study of the presence of *Bacterium abortus* (Bang) in milk, L. H. COOLEIDGE (*Michigan Sta. Tech. Bul. 33 (1916), pp. 5-37, figs. 2*).—This publication includes a brief review of the history of bovine infectious abortion and results of investigations conducted by the author along the following lines: (1) Methods of studying the presence of *B. abortus* in milk; (2) a study of its effect upon man; and (3) facts disclosed by a study of its presence in milk by means of the agglutination test (*E. S. R., 38, p. 286*).

The agglutination and complement fixation tests were employed, using milk and milk serum instead of blood serum and following a modification of the technique of Surface (*E. S. R., 27, p. 581*). Results of this part of the investigation show that there is apparently no connection between the *B. abortus* antibody content of the blood and of milk. The antibody content of the milk may vary from quarter to quarter of the udder, showing that the antibodies present are due to local infection and do not come from the blood stream. As high or a higher antibody and cellular content in the strippings than in the fore milk seems to indicate active infection and the presence of *B. abortus* in the milk in sufficient numbers to produce the typical lesions and blood reactions on inoculation in guinea pigs. A lower antibody and cellular content in the strippings seems to indicate that infection is slight and that the organism is not present in sufficient numbers to cause infection. The agglutination reaction appears to be more reliable than the complement-fixation test. A pure culture of *B. abortus* introduced into the milk cistern of a cow's udder causes the appearance of agglutinins in the milk. The presence of the organism has always been found to be accompanied by the agglutinins for the organisms, but the presence of agglutinins does not always signify the presence of the organism itself. Agglutinins may be present in the milk of cows that have aborted and those that have never aborted.

In the second part of the investigations reported an examination was made of the sera of a number of persons drinking raw milk, pasteurized milk, and no milk by the complement fixation and agglutination tests, using *B. abortus* as antigen. To determine whether or not *B. abortus* antibodies could be made to appear in the sera of adults by injection of infected milk, a feeding experiment was conducted in which the milk used had a high *B. abortus* antibody content. The use of this infected milk caused antibodies to appear in the blood serum, apparently indicating a passive immunity due to the absorption in the intestine of the antibodies present in the milk. There was no proof that *B. abortus* is pathogenic for human beings.

A bibliography of 33 titles is appended.

The transmission of *Bacterium abortus* (Bang) to newborn calves through the ingestion of milk, I. F. HUDDLESON (*Michigan Sta. Tech. Bul. 32 (1916), pp. 5-22*).—The possibility of the transmission of *B. abortus* to calves through the ingestion of milk was studied by feeding newborn calves with "naturally infected milk," that is, milk reacting positively to the agglutination test using *B. abortus* as antigen, and with "noninfected milk." The results of the feeding experiments were studied by means of the agglutination and complement fixation tests upon the blood sera of the calves using *B. abortus* as antigen. The calves were bled from the jugular vein at intervals of about a week and the blood sera tested. Observations and microscopical examinations for matting and staining of the sexual hairs of the calves were made during the course of the feeding.

Eight calves were fed upon naturally infected milk, six upon noninfected milk, a control was fed pasteurized naturally infected milk, and a second control was fed noninfected milk plus 5 cc. of a 48-hour bouillon culture of *B. abortus* in order to compare the result from feeding naturally infected milk with that of artificially infected milk. Tables are given showing the history of the dams of the calves used in the experiments and the results of the various feeding experiments. These results show that "agglutinating and complement fixing bodies for *B. abortus* are very rarely demonstrated in the blood of calves as a result of ingesting naturally infected milk. Calves may give a positive reaction to the complement fixation test immediately after birth. The reaction probably signifies a prenatal infection. There is favorable evidence that antibodies circulating in the body of the mother are not transmitted to the fetus in utero.

"The data strongly emphasize the necessity of testing the blood of calves at birth in order to differentiate between positive reactions that may be due to the ingestion of milk and positive reactions that may be present at birth. There appears to be no connection whatever between the feeding of milk and the matting and staining of the sexual hairs of newborn calves."

The relation of streptococci to bovine mastitis and septic sore throat, D. J. DAVIS (*Amer. Jour. Pub. Health*, 8 (1918), No. 1, pp. 40-46).—This is a brief summary of information on the subject.

The author has failed to find any evidence that strains of streptococci pathogenic to man can resist the usual temperature for pasteurization, namely, 145° F. for 30 minutes. In tests made by him of 98 strains of streptococci none of 24 pathogenic hemolytic streptococci of human origin resisted 140° for 30 minutes. Twenty of 74 strains of hemolytic streptococci of milk origin and having practically no virulence resisted 155° for 30 minutes.

Piroplasmosis of cattle in Panama, H. C. CLARK (*Jour. Infect. Diseases*, 22 (1918), No. 2, pp. 159-168).—The data here presented have been summarized by the author as follows:

"Piroplasmosis of cattle is present and practically speaking universal in Panama. Nonimmune cattle when imported into Panama contract the disease and many of them die. A positive ante mortem diagnosis of piroplasmosis in this locality is extremely difficult on account of the scarcity of the parasites in the peripheral blood. The examination of the blood in films of the gray matter of the brain makes the detection of the parasite at necropsy and in the abattoir comparatively easy. In Panama piroplasmosis has been found in the horse, cattle, deer, and dog.

"Investigations of native cattle led to the observation that they are hosts in almost every instance to *Babesia bigemina*, filaria, sarcosporidia, and a large trypanosome, probably of a harmless type. Two cattle revealed a spirochete, probably *Spirochaeta theileri*."

A trypanosome of Panamanian cattle and a method for concentrating trypanosomes in peripheral blood, O. TEAGUE and H. C. CLARK (*Jour. Infect. Diseases*, 22 (1918), No. 2, pp. 154-158).—"Trypanosoma theileri occurs in a large percentage of beef cattle in Panama. It is present in such small numbers in the peripheral blood that stained smears are uniformly negative. After defibrinating the blood, treating with an equal volume of distilled water, and centrifugating, we find it almost always in smears from the sediment. Filaria are also readily demonstrated in the blood of Panamanian cattle by the same procedure, although they are very rarely found in ordinary blood films. The trypanosome is readily cultivated in broth at 24 to 26° C., but undergoes marked changes in morphology in the culture. Inoculation into species of animals other than cattle yielded negative results."

Eradication of the cattle tick, F. THOMSON, F. KEOGH, and G. TUCKER (*Queensland Agr. Jour.*, n. ser., 8 (1917), No. 6, pp. 302-307).—A report on observations of the efficacy of tick-destroying mixtures.

Staggers in sheep in Patagonia, F. S. JONES and J. F. ARNOLD (*Jour. Expt. Med.*, 26 (1917), No. 6, pp. 805-823, pls. 4, fig. 1; *abs. in Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 4, pp. 473, 474).—This report from the Department of Animal Pathology of The Rockefeller Institute for Medical Research relates to investigations made of a nervous disease of sheep which during the past few years has become more prevalent throughout portions of Patagonia. It is not confined to the ovine species alone; horses and cattle readily succumb to it. The affection is known by a number of names, among the more common being staggers, tembleque, loco, and huecû. The disease seems to be widespread, existing throughout the pampas at least as far north as the Chubut Valley and extending southward to Deseado and from the eastern boundary of the pampas to the Andes. The incidence varies greatly with the condition of the food supply, the actual number of cases being small when there is a liberal amount of grass, but after a long-continued drought when the fine grass supply is short the number of sick animals is large.

The investigations reported, based upon experimental work both in the field and laboratory, have led the authors to consider the following conclusions justified: "Staggers is a noninfectious disorder affecting horses, cattle, and sheep. The disease is characterized by weakness, muscular twitching, irregular movements of the head, stiffness of the limbs, and transient motor paralysis, accompanied with spastic spasms on excitement. There is also a derangement of vision and conjunctivitis. The post-mortem lesions are not characteristic. We readily produced the disease by feeding susceptible sheep on a coarse tuft grass, commonly known as coiron or pampas grass (*Poa argentina*). The time required to produce definite symptoms by feeding the grass varied. Two animals developed typical staggers after two feedings; in another instance a period of 21 days of feeding was required. The average time for the production of unmistakable symptoms in our experiments was 10 days. Many sheep recover from staggers spontaneously. A complete change of diet will usually effect a cure within two weeks. Older animals that have pastured for long periods on lands where the grass grows become tolerant and rarely are affected with staggers. The grass is toxic to sheep at all seasons of the year. We fed late winter and early spring grass and grass in flower, and produced staggers in every instance. The young green grass is as toxic as any edible portion of the plant."

[Diseases of the horse], F. A. HOFFMAN (H. BUSCHBAUER) (*Das Pferdebuch des Amerikanischen Farmers*. Milwaukee, Wis.: Germania Pub. Co., 1917, rev. ed., pp. 223, pls. 3, figs. 46).—This is a small handbook which deals largely with the anatomy and diseases of the horse.

Pyotherapy in the treatment of harness wounds, VELU (*Rec. Méd. Vét.*, 94 (1918), No. 1-3, pp. 19-21).—In connection with researches on pyotherapy, previously noted (*E. S. R.*, 38, p. 588), the author has shown the efficacy of the method in the treatment of nonspecific lesions in horses and mules caused by the harness. The cases were treated with polyvalent vaccines, either anti-cryptococcic vaccine or vaccine prepared from the products of ordinary supurations.

Some external parasites of poultry, D. C. MOTE (*Ohio Sta. Bul.* 320 (1917), pp. 139-156, figs. 15).—This is a brief popular summary of information for use by poultry raisers.

RURAL ENGINEERING.

The subterranean waters of Australia, J. G. RICHERT (*Abs. in Chem. Abs.*, 12 (1918), No. 8, p. 841).—Referring to the decrease in the capacity of wells in the artesian districts of Australia, two theories of the source of the water of these wells are discussed: (1) That the wells are fed by infiltration of rain-water and by condensation of air circulating through the underground, and (2) that the waters are chiefly plutonic, stored in the underground during preceding geological ages. The author thinks that both views are probably correct and that the progressive decrease of the flow from the wells is not proof of exhaustion of local stores of water but is due to a progressive sinking of the free-water level which may go on for hundreds of years.

Reducing seepage in earth reservoirs, S. T. HARDING (*Jour. Electricity*, 39 (1917), No. 11, pp. 494-496, figs. 2).—This article gives data showing the effectiveness of clay puddle, oil, and concrete linings in reducing seepage in earth reservoirs. Cost data are included, it being shown that a clay or oil lining costs about 1 ct. per square foot, plaster linings about 3 cts., and heavier concrete linings about 6 cts. per square foot.

Septic sewage tanks of tile pipe, J. H. PERRY (*Dom. Engin.*, 81 (1917), No. 11, pp. 454-457, figs. 6).—This is a discussion of the design and construction of small septic tanks of tile pipe, in which sedimentation is considered the primary factor. It is pointed out that a shorter period of detention and a very much higher rate of velocity than is used with the tanks of larger size will accomplish quite satisfactory results with reference to sedimentation. In spite of the fact that a septic tank is described, no effect of bacterial action is discussed as a factor in the clarifying process.

Durability of cement draintile and concrete in alkali soils, R. J. WIG, G. M. WILLIAMS, and A. N. FINN (*U. S. Dept. Com., Bur. Standards Technol. Paper* 95 (1917), pp. 94, pls. 44, fig. 1; *abs. in Engin. News-Rec.*, 78 (1917), Nos. 2, p. 81; 5, p. 277; *Jour. Franklin Inst.*, 183 (1917), No. 5, pp. 625-628, fig. 1; 185 (1918), No. 3, pp. 410, 411).—"The report covers a cooperative investigation, under the auspices of the Bureau of Standards, into the disintegration of concrete when exposed to strongly alkalined soils and waters in the arid regions of the western part of the United States. In some cases well-fabricated structures are attacked. In other cases the structures do not appear to be affected by the salts. The purpose was to discover, if possible, the causes of such action and to ascertain the best methods of avoiding deterioration.

"The paper shows that the use of cement is still experimental, that porous tile are especially liable to attack, that even dense tile are subject to surface disintegration. The action seems to increase with sulphate and magnesium content. Rather full data are given and the paper is well illustrated with photographs, diagrams, and graphic charts."

Economical proportions for Portland cement mortars and concretes, J. A. KITTS (*West. Engin.*, 8 (1917), No. 11, pp. 429-433, figs. 4).—This paper was presented before the American Society for Testing Materials, and reports tests from which the following conclusions are drawn:

As regards mortars "sand-cement mortars are not comparable in simple weight proportions because of the wide variation in the corresponding volumetric-proportions and the variations of the void-filled ratios. Sand-cement mortars are not comparable in simple volumetric proportions because of the wide variations of the void-filled ratios. The void-filled ratio has a general effect upon the strength, permeability, and economy of a mortar and undoubtedly affects the density and yield. An important function of the cement-paste is to fill the voids in the sand. Sand-cement mortars are properly comparable

on the basis of the void-filled ratios. The economical proportions for sand-cement mortars depend upon the void contents of the sands. . . . The economy factor expresses the relative efficiency of mortars. . . . No general relation of silt-content, uniformity, coefficient, and absorption to the efficiency of sands is found."

As regards concretes "an important function of a mortar in concrete is to fill the voids in the coarse aggregate. The efficiency of a concrete mixture depends largely upon the efficiency of the mortar. For economical proportions the volume of cement should be equal to or greater than the volume of voids in the sand, but should not exceed 1.5 times the voids in the sand, and the volume of mortar should be equal to or greater than the volume of voids in the coarse aggregate, but should not exceed 1.5 times the voids in the coarse aggregate."

Cement saved by using screened and remixed gravel instead of pit-run gravel, J. P. NASH (*Engin. and Contract.*, 48 (1917), No. 19, p. 370, figs. 2).—Experiments are reported which showed that the pit gravel used to make a 1:7 mix, when screened and remixed in the proportions of 1:3.5:7, required 0.8 sacks less cement to make a cubic yard of concrete. "This is in spite of the fact that the latter shows a 20 per cent increase in strength." A table is given showing the amounts of material required to make a cubic yard of concrete, using pit-run gravel. "It is believed that the amount of pit-run gravel or screened gravel required for a cubic yard of concrete will be but little different even though the proportion of sand in the pit-run gravels varies considerably. The saving in cement, however, would be greater in direct ratio with the amount of sand in the pit-run gravel."

Tests of blast-furnace slag as aggregate in concrete (*Cement and Engin. News*, 29 (1917), No. 12, pp. 308-310, fig. 1).—Experiments conducted at the Pittsburgh testing laboratory are reported.

"One-half of the tests of the slag concrete were made using slag produced by the quick-cooling process in pits, in which the slag is shipped within a few days from the time it comes from the furnace, and the remainder from slag which had been seasoned in banks for a period of 6 months in some cases and as much as 15 years in one case. The length of time during which this series of tests has been conducted does not warrant the drawing of any definite conclusions, but the general uniformity of the results of the crushing tests of the concrete should be observed. Slags coming from furnaces many hundred miles apart, varying quite widely in chemical analyses, and also varying considerably in the weight per cubic foot, do not vary in strength in proportion to either the weight or percentage of any chemical constituent."

Experiment of Wisconsin Highway Commission in improvement of sand roads by hay and tar mats, H. J. KUELLING (*Engin. and Contract.*, 48 (1917), No. 19, pp. 362, 363, figs. 3).—An outline of the construction of experimental sections is given. These are to be reported on later.

Applications of motors to piston pumps and pump jacks (*Jour. Electricity*, 39 (1917), No. 10, pp. 463, 464, fig. 1).—Practical information is given on the proper length of belting, motor speed, foundation, etc., including a table of corresponding sizes, a formula for determining diameters, and rules for other elements involved.

"From the electric standpoint, the principal points involved in making installations of this kind are the selection of a motor of the proper size and starting characteristics, and suitable protective and controlling devices. Except in special cases, the motor selected should be large enough to permit the pump to be operated continuously without overheating of the motor. It is not good practice in these installations to adopt a smaller motor and depend upon the

overload capacity and the intermittent nature of the service to prevent overheating in the motor. In selecting motors based on the intermittent duty rating there is always the danger of choosing a rating too small for the work and therefore possibilities of overloading the motor. When single-phase motors are used for these installations they should be of the repulsion-induction type on account of the high torque developed at starting."

Electric plowing, A. DELAMARRE (*Rev. Gén. Élect.*, 1 (1917), May 5, pp. 691-700; *abs. in Sci. Abs., Sect. B—Elect. Engin.*, 20 (1917), No. 236, pp. 285-287).—"The author discusses various systems of power plowing and shows the advantages of electric plowing. Tractors are not essential for deep plowing; the windlass and rope method is equally effective, uses cheaper equipment, and does not consolidate the soil in the same way as a heavy tractor. The tractive effort required varies with the nature and condition of soil and with the depth and breadth of the furrow. Ringelmann's tests with double Belgian plows indicate that the tractive effort per dm.² is as follows: Light soil, 36 to 40 kg.; heavy soil, 55 to 60 kg.; alfalfa (4 years), 87 kg.; heath . . . 63 kg. A general formula for work done is $P = klpv$, where k is a tractive coefficient varying with the nature of the soil, l the width and p the depth of furrow, and v the speed of plowing.

"A given area may be plowed to specified depth in specified time either by plowing a wide strip at low speed or plowing a narrow furrow at high speed. The former alternative necessitates heavy and costly tools, cumbersome and difficult to move; the other method is subject to a speed limit of 2 meters per second, or, better, 1.3 to 1.4 meters per second, beyond which it becomes difficult to steer the plow. To plow 30 cm. deep and 90 cm. wide in heavy soil, using a multishare plow at 1.4 meters per second, corresponds to $P = 2, 268$ kg.-m./sec. = 30 horsepower. This is the minimum theoretical horsepower, and the hauling gear should be capable of at least 60 horsepower to allow for roots, large stones, and various losses. Electric windlasses built for plowing service are generally of 75 to 90 or 100 horsepower. A 60-horsepower machine under the above conditions will plow about 0.45 hectare per hour or 3.5 hectares per 12-hour day, assuming 65 per cent coefficient of utilization. A 90 or 100 horsepower set will plow 5 or 6 hectares per diem, but it is desirable to use a light equipment rather than an extra powerful one.

"Whatever the motive power employed, the plow may be hauled by a windlass or a tractor, or an automobile plow may be used. . . . Rope haulage is at present generally preferred and most widely useful. Two windlasses may be used or one double-drum windlass may drive a loop of rope which runs over an anchored pulley at the other side of the field. With two windlasses only one rope is needed. In either case a tilting double-ended plow is used. The single windlass system costs little more than half the cost of two windlasses, and further important economy results from only a single supply line being needed. On the other hand, anchoring the return pulley is rather troublesome; it takes more time to adjust the gear; rope wear is twice as costly; and the system can only be used satisfactorily on level ground. The double windlass system can be used for spans of 600 meters or more, and over very rough ground. Tractors may be used for shallow plowing (15 to 18 cm.), breaking stubble, harrowing, etc., though they are unsuitable for deep plowing owing to their limited tractive effort and poor tractive efficiency if heavy."

Cost data are also given.

Quality of plowing and the draft of plows, R. OLNEY (*Power Farming*, 27 (1918), No. 1, p. 9, figs. 4).—The author, in describing good and poor plowing with reference to plow draft, shows that good plowing depends primarily on the

condition of the soil and the shape of the moldboards. A moldboard that pulverizes the soil most thoroughly and turns the furrow properly requires proportionately more draft to pull it through the soil.

RURAL ECONOMICS.

The new business of farming, J. A. DIMOCK (*New York: Frederick A. Stokes Co. (1918), pp. [7]+120*).—Among the topics discussed in this book are the following: Size of the farm from a business standpoint, capital necessary in farming, diversity, big crops *v.* normal, rotation of crops, competition and the laws of prices, fitting the scheme to conditions, coordination of enterprises, the opportunity for the individual, live stock on the farm, and the farm as a home. A brief bibliography is appended.

Report of the land development committee of the Ceylon Agricultural Society ([*Colombo: Ceylon Agr. Soc., 1917*], pp. 42).—In order to increase settlement upon the land the committee recommends that lands be made available in fair-sized blocks for capitalists on a leasing system, in blocks of under 10 acres for small capitalists on a leasing system, with subsequent rights to freehold after development, and in free grants of land to peasant settlers in regular settlements with provision for their acquiring proprietary rights after a period of 10 years. Great importance is attached to the expeditious survey of lands and the provision of irrigation channels as a preliminary to settlement and to the prompt removal of crown timber. Medical aid and roads should be supplied for all settlements, and a colonization officer and a demonstration plat when the settlement consists of more than 25 families. The Government should also be prepared to furnish these settlements with adequate financial assistance during the initial stages.

Land settlement in the Union: Future of returned soldiers (*So. African Jour. Indus., 1 (1918), No. 5, pp. 414-424*).—This article describes lands available for settlement, types of farming, terms of disposal, financial assistance, and experience and capital necessary, as well as conditions of settlement in Canada, Australia, and New Zealand.

The Agricultural Holdings Acts, 1908-1914, T. C. JACKSON (*London: Sweet & Maxwell, Ltd., 1917, 3. ed., rev. and enl., pp. XVI+356*).—This work is intended to serve the dual purpose of supplying a text of the Agricultural Holdings Act of 1908-1914, with commentaries and notes, and a manual on tenant right valuation.

The Torrens system of land title registration (*Philadelphia: Dept. Pub. Works (1916), pp. 10*).—This report contains a brief history of the system, some comparisons, and a plea for the proper safeguarding of the standards of surveying under the proposed Pennsylvania act.

Annual report of the Jewish Agricultural and Industrial Aid Society, 1917 (*Jewish Agr. and Indus. Aid Soc. Ann. Rpt. 1917, pp. 46*).—This report continues information previously noted (*E. S. R., 36, p. 894*), calling attention to the various changes necessary in the organization of the society to meet the present crisis.

The Federal Farm Loan Act, J. E. POPE (*Bur. Applied Econ., Dept. Banking and Public Finance, Bul. 1 (1917), pp. 58*).—This book points out the salient features of the Federal Farm Loan Act, and discusses its various provisions.

State institution farms, W. B. DURYEA (*N. J. Dept. Agr. Bul. 10 (1917), pp. 361-395, pls. 4*).—This bulletin describes the management on the farms connected with the various State institutions in New Jersey, and outlines methods for improvement.

Report of the committee on mobilization of high school boys for farm service (*Boston: Wright & Potter Printing Co. (1917), pp. 60, pl. 1*).—This report describes the methods of mobilization, the organization of the camp, and the results obtained in placing city boys on farms. It recommends the establishment of schools for training camp supervisors and cooks, and local responsibility for recruiting and financing.

The State market commission of California, C. C. PLEHN (*Amer. Econ. Rev.*, 8 (1918), No. 1, pp. 1-27).—This report discusses the activities of the commission, especially with reference to the marketing of fruit and fish.

From car door to consumer, H. C. FILLEY (*Nebraska Sta. Circ.* 5 (1918), pp. 20, figs. 2).—The author points out that the delivery of merchandise from freight car direct to purchaser has been a common practice for many years. He discusses the extent of the use of this method of distribution particularly as applied to apples, its cost, and its effect upon the price received by the producer as well as by the consumer. He concludes that the box car peddler has been a popular means of marketing apples, potatoes, and other products, and that, unless the public is to suffer, his function must be filled by consumers' and other organizations. He also recommends the cooperation of dealers as well as purchasers in ordering by carload quantities.

Live stock economics, I. TANIMURA (*Shiba, Tokyo: Oriental Printing Co., Ltd.*, 1917, pt. 1, 2. ed., pp. [2]+X+88+14, figs. 69).—This is the first part of a report on the live-stock industry, and discusses the industry in the United States, breeding and selection, feeding and management, work animals and farm labor, wool and by-products of sheep, the dairy industry, animal flesh as food, animal waste and products of the packing-house, preservatives of milk, meat, etc., cost of production and marketing, human nutrition and animal hygiene, regulations, associations, etc.

Social surveys of three rural townships in Iowa, P. S. PERCE (*Studies Soc. Sci., Univ. Iowa*, 5 (1917), No. 2, pp. 88).—Among the topics discussed by the author are the geographical features, population, economic conditions, housing, household conveniences and sanitation, educational conditions and influences, religious conditions, recreation, amusement, and social life.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt.*, 4 (1918), No. 3, pp. 21-32, fig. 1).—This report contains the usual data with reference to the estimated farm value of important products February 15 and March 1, average prices received by producers, and the range of prices of agricultural products at important centers. It also contains a crop summary for March, special data relating to farm stocks March 1, 1918, and shipments out of the county where grown, of wheat, oats, corn, and barley. It has special articles regarding the methods of hiring farm labor, wages of male farm laborers, the number of farmers and farm laborers in 1910, and contains special data on prices of articles bought by farmers, monthly farm marketing of wheat, conditions in Florida and California as to crops, the world's potato crop, cabbage for kraut, and peas for canneries, wheat held by country mills and elevators, exports of wheat, wheat fed to live stock, and the seed corn deficiency for 1918.

The story of Colorado—farming, mining, manufacturing (*Denver, Colo.: State Bd. Immigr.* [1917], Nos. 1, pp. 15, figs. 11; 2, pp. 23, figs. 25; 3, pp. 15, figs. 9; 4, pp. 31, figs. 25; 5, pp. 31, figs. 46; 6, pp. 31, figs. 16; 7, pp. 15, figs. 11).—These numbers contain data on the topography, climate, history, crops, and live stock produced, together with opportunities for settlement, for each county of the following districts: Northwestern Colorado, the Western Slope, the San Luis Valley, the Arkansas Valley, eastern Colorado, the South Platte Valley, and Southwestern Colorado.

Agricultural statistics of Denmark (*Statist. Aarbog. Danmark*, (1917), pp. XXIV+256+[4]).—This report continues information previously noted (E. S. R., 37, p. 392), by adding data for a later year.

The industrial resources of the Union of South Africa, C. DU CHIAPPINI (*Jour. Roy. Soc. Arts*, 66 (1918), No. 3404, pp. 227-243).—In this report are discussed the agricultural, mineral, and manufacturing resources of the Union of South Africa, together with the extent of the population. For the agricultural resources data are given as to the production and import and export trade.

AGRICULTURAL EDUCATION.

The future of agricultural education and research in the United States, W. H. JORDAN (*Science*, n. ser., 47 (1918), No. 1206, pp. 125-134).—In this, the vice-presidential address before Section M, American Association for the Advancement of Science, the author discusses the problem of efficiency as related to the functions which agricultural colleges and experiment stations should perform, including a consideration of their aims, in which are found the great essentials of educational efficiency.

He concludes briefly that "the agricultural colleges should not establish entrance requirements and curricula chiefly with reference to turning out practitioners, but should give prominent consideration to training men and women for effective agricultural leadership." In his opinion agricultural research worthy of the name should depend upon the method or plan under which the scientist is working and the quality of the effort applied to the problem, and not upon the title of the project. He maintains that the history of agricultural science shows clearly that substantial progress has been made only when the studies of the experiment stations have been confined to "the narrow individual factors that are involved in agricultural production, rather than driving directly at broad generalization or answers to business problems which include the operation of many factors." The conditions essential to the successful direction and maintenance of education and scientific research, which it is agreed are freedom of administrative initiative, such organization and relations as are stimulating both to the teacher and to the research worker, and the possibility of maintaining a continuous policy in the conduct of the institution, are outlined.

With reference to the relation of the Federal Government to the agricultural colleges and experiment stations, the author states that while the earlier Federal acts placed little restriction upon the several States, Federal supervision under the later Smith-Lever and Smith-Hughes Acts is regarded by many as having approached the danger point, not so much because of what is now the Federal policy as because of the future possibilities under the provisions of these acts. The efficiency of agricultural education and research, it is held, is also threatened by the budget system in some States. "There is every reason to fear that if present tendencies toward the closer control of agricultural education and research institutions by committees and bureaus is not checked, efficiency in education and research will abide only with privately endowed institutions."

Agricultural education.—What is it? D. SNEDDEN (*School and Soc.*, 7 (1918), No. 160, pp. 66-71).—In this article the author assumes that the chief function of the agricultural school is to train farm laborers along narrow lines, as is common in trade schools, and he ignores the breadth of training necessary for the managing owner of a farm. He also assumes that diversified farming should be and will be replaced by intensified specialization. This point of view colors the entire article, as the plea is made for narrow specialization.

The reorganization of high-school science, F. D. BARBER (*School Sci. and Math.*, 18 (1918), No. 3, pp. 247-262, figs. 6).—In this analysis of the nature and the significance of shifts that have occurred and are occurring in the high-school science curriculum, the author claims that "physics is now nearly holding its own, that chemistry is making slight gains, that physical geography, physiology, botany, and zoology are all rapidly losing ground and will soon disappear as high-school subjects, or at least they will soon become unimportant subjects in the high-school curriculum."

Agriculture and domestic economy are everywhere making rapid gains. During the five years from 1910-1915 the percentage increase in relative enrollment in agriculture in the high schools was 54 in the United States, 513 in Iowa, 24 in Wisconsin, 52 in Illinois, and 231 in Ohio; in domestic science 241 in the United States, 593 in Iowa, 237 in Wisconsin, 65 in Illinois, and 340 in Ohio.

Graphs are included indicating that before the advent of agriculture, domestic economy, and general science, 1900-1915, all of the old recognized sciences were suffering a rather rapid decline. The author is convinced that had the courses in the physical and biological sciences, offered in the first two years of the high school, afforded the proper foundation for the study of agriculture and domestic economy, in the better school systems, these two new applied sciences would have been placed farther up in the course, presumably displacing physics and chemistry.

In his opinion, the proper reorganization of high-school science consists in the establishment of a required stem course of science which shall incorporate the elements of historical significance and scholarship from the old régime with the elements of true worth and interest from the new régime. This course should be two years in length and must deal with materials of universal value, present science in its psychological and pedagogical order, not the logical order of special science, and must recognize the natural interests and the point of view of the pupil and not of the trained scientist; it must afford the necessary foundation for an understanding of the principles involved in the art of agriculture and the art of domestic economy, and at the same time it must provide the foundation for the further study of science in the college and university. It should be equally applicable to the 2-year, 3-year, and 4-year high school, and the rural and the urban high school. Its organization must be that of general science and not that of special science, and it might most appropriately be called a "2-year course in general science." Suggested subject matter for such a required 2-year course is outlined and attention is called to its advantages.

In addition to this basic course, every rural high school should offer courses in agriculture and practically all high schools courses in domestic economy. These special courses, however, may be shortened materially, as the basic course will deal with materials closely related to the materials utilized in the special courses. The author believes that they will inevitably treat less of the theoretical aspects of science and more of the practical aspects. Eventually, when the junior high school becomes an important reality, the seventh year may well be devoted to nature study during the fall and spring months, and to physiology and hygiene during the winter months. The first year's work of the proposed 2-year course in general science can be done in the eighth year and the second year's work in the ninth, thus leaving three years devoted to agriculture, domestic economy, or special science courses.

Shall forestry be taught in the public schools? J. W. TOUMNEY (*Amer. Forestry*, 24 (1918), No. 290, pp. 103-108, figs. 6).—The author advocates instruc-

tion in forestry in the public schools, especially in forested regions. The time for such instruction, in his opinion, should depend largely upon the location of the school and to what extent the pupils of the particular locality will in later life be identified with the production and utilization of forest products. He believes that for the lower grades forestry can best be taught in connection with other subjects. In the primary grades it should be taught as a part of nature study, as is already being done in some parts of the country, and in the grammar grades it should be taught in field excursions and in connection with courses in geography, civil government, and United States history. In the high school, also, the instruction should be mainly in connection with other courses, viz, physical geography, manual training, and botany.

As in most parts of the country the production of farm crops and of wood crops go hand in hand under common ownership, the woodlot being still a part of almost every farm, the author believes that in most localities a part of the work of the agricultural high school should be given to forestry. This work should cover approximately 20 weeks and consist of a course in the introduction to forestry, giving a general knowledge of the subject and the importance of forestry in the economic development of the country, and a course in farm forestry, which should be sufficiently comprehensive to cover all phases of forestry that relate to the production and utilization of timber on the farm.

In view of the fact that forest crops are profitably produced on soils too poor for farm crops, great areas of this country, possibly 20 or 25 per cent of the total area, must remain forever in forest. In these regions forest trade schools or ranger schools are deemed as necessary as trade schools are in cities. Their instruction must aim to teach the art or trade of forestry, including all the operations incident to the ownership and utilization of timbered lands. The character and method of instruction should vary with the local requirements which the student must be prepared to meet after the completion of his course. The instructors should be professional foresters. Such schools should become a part of the public-school system in this country wherever the forest is the dominant resource and provides employment for a considerable percentage of the inhabitants.

Illustrated lecture on renovating the neglected apple orchard, H. M. CONOLLY (*U. S. Dept. Agr., States Relat. Serv. Syllabus 31 (1918), pp. 16*).—This lecture, which deals with the feasibility, possibility, cost, and methods of renovating old orchards, is an adaptation of Farmers' Bulletin 491 (E. S. R., 27, p. 241), with additions and changes for the special purpose of aiding farmers' institute and other extension lecturers. It has been prepared in co-operation with the Division of Horticultural and Pomological Investigations of the Bureau of Plant Industry. A list of 50 lantern slides to illustrate the syllabus is included.

MISCELLANEOUS.

Thirtieth Annual Report of Indiana Station, 1917 (*Indiana Sta. Rpt. 1917, pp. 84*).—This contains the organization list, reports of the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the Federal funds for the fiscal year ended June 30, 1917, and for the remaining funds for the period ended September 30, 1917.

Thirty-fifth Annual Report of New York State Station, 1916 (*New York State Sta. Rpt. 1916, pt. 1, pp. VIII+820, pls. 89, figs. 43*).—This contains the organization list; a financial statement for the fiscal year ended June 30, 1916; a list of the periodicals received by the station; and reprints of Bulletins

414-428, Technical Bulletins 48-56, popular editions of Bulletins 415, 417, 418, 419, 422, and 423, and Circulars 47 and 48, all of which have been previously noted, and of Circulars 49, The Cherry Leaf-beetle, by F. Z. Hartzell and P. J. Parrott; 50, Periodical Cicada in 1916, by P. J. Parrott and H. E. Hodgkiss; and 51, Some Insects Attacking the Pear, and Their Control, by P. J. Parrott.

Report of the Porto Rico Insular Station, 1916-17 (*Rpt. Bd. Comrs. Agr. P. R.*, 6 (1916-17), pp. 131, figs. 8).—This contains the organization list, a report by the director for the fiscal year 1916-17, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Reports of Virginia Station, 1915 and 1916 (*Virginia Sta. Rpts. 1915-16*, pp. 213, figs. 36).—This contains the organization list, reports of the director and heads of departments, financial statements for the fiscal years ended June 30, 1915, and June 30, 1916, and a number of special articles and reprints of Technical Bulletins 12-18, abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 3, pp. 65-98, figs. 16).—This contains several articles abstracted elsewhere in this issue, together with the following: Spring Wheat, by C. G. Williams; Seed Corn for 1918, by C. G. Williams; Using Forage in Pig Feeding, by W. L. Robinson; Beet-sugar Production, by C. E. Thorne; Delayed Applications of Lime-sulphur, by P. Thayer; Dormant Spray Controls Peach Leaf Curl; Climbing Roses, by W. E. Bontrager; and notes.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 5 (1918), No. 12, pp. 173-188).—This number contains brief articles on the following subjects: Growing and Marketing of Grapes, by R. T. Reid (see p. 49); The Importance of Investigational Work in the Field of Marketing, by A. Hobson; Lousiness in Domestic Animals, by J. W. Kalkus; Dairy Feed Supply, by W. A. Linklater; and War Chicks, by Mrs. G. R. Shoup (see p. 75).

NOTES.

Arizona University and Station.—E. P. Taylor, of the extension service, has been appointed assistant dean of the college of agriculture. G. E. Thompson, extension specialist in crops in the Kansas College, has been appointed head of the department of agronomy.

Arkansas University and Station.—*Science* states that W. S. Fields has resigned as assistant professor of plant pathology and assistant plant pathologist to take up work as extension plant pathologist under the Bureau of Plant Industry of the U. S. Department of Agriculture, with headquarters in Mississippi. G. G. Becker, assistant professor of entomology and entomologist, has resigned to enter military service, and was succeeded June 20 by W. J. Baerg.

California University and Station.—It is announced that over 34,000 students are now enrolled in the 27 correspondence courses in agriculture offered by the university. A two months' course at Davis in practical farming was recently completed by several women.

Dr. J. C. Whitten, professor of horticulture and horticulturist at the Missouri University and Station, has accepted a position as head of the division of pomology.

Georgia College.—John T. Wheeler, assistant professor of horticulture in the Massachusetts College, has been appointed head of the department of agricultural education, with L. M. Sheffer as assistant in charge of agricultural education work in secondary schools.

Hawaii College.—L. A. Hanke has been appointed head of the department of agriculture.

Purdue University and Station.—A second division of the Boys' Working Reserve has completed its training under the school of agriculture, making available several hundred boys for farm service.

C. M. Vestal, in charge of animal nutrition work at the Kansas College and exchange professor during the past year with the University of California, has been appointed associate in animal husbandry. Dr. G. H. Roberts has been appointed associate veterinarian in the station. J. C. Beavers, assistant in soils and crop extension, resigned August 31 to return to his farm in North Carolina, and R. A. Nehf, assistant in horticulture, to enter a Coast Artillery camp.

Iowa College and Station.—Recent appointments include the following assistants: Edgar Collins in agricultural engineering, D. M. Merrill, P. E. Nordaker, H. J. Harper, B. J. Firkins, A. J. Elwell, T. H. Benton, P. C. Wiechman, C. H. Artiss, and F. M. Russell in the soil survey, F. S. Wilkins in farm crops, A. R. Morgan in dairying, and J. L. Horsfall in entomology. Leave of absence for the duration of the war on account of military service has been granted O. F. Jensen, assistant in field crops, and D. E. Bailey, assistant in dairying. Dr. Orren Lloyd-Jones, associate professor of animal husbandry, and Paul M. Wolf, assistant in the soil survey, have also resigned.

Kansas College.—Arrangements have been completed for the enrollment of the students of the Kansas City Veterinary College, which is closing for the period of the war.

Dr. C. W. McCampbell, associate professor of animal husbandry and secretary of the State Live Stock Registry Board, has succeeded W. A. Cochel, resigned, to become western field man of the American Shorthorn Breeders' Association, as head of the department of animal husbandry. H. F. Lienhardt, in charge of poultry disease investigations, has been granted leave of absence for the period of the war to engage in military service as second lieutenant in the Medical Corps.

Louisiana Stations.—G. D. Cain, chief chemist of the fertilizer control laboratory, has been appointed assistant director of the North Louisiana station at Calhoun. W. M. Hall, assistant chemist at the State station, has been appointed chief chemist of the fertilizer and feedstuffs control laboratory. J. H. Jolley and C. F. Sheffield have been appointed assistant chemists.

Maryland College and Station.—President A. F. Woods has been selected as chairman of the Agriculture Committee of the National Research Council.

Recent appointments include the following assistants: C. C. Shivers in veterinary medicine, A. M. Smith in soil chemistry, and S. V. Eaton in plant physiology.

Minnesota University and Station.—H. H. Kildee, chairman of the dairy husbandry division, has resigned to become chief of the animal husbandry division of the Iowa College. J. S. Montgomery, associate professor of animal husbandry, has resigned to engage in commercial work, and Earl Weaver and H. R. Searles, respectively, assistant dairy husbandman and instructor in dairy production, to enlist in the United States Marine Corps.

Thomas Shaw, professor of animal husbandry from 1893 to 1903, died June 26, aged 75 years. Prof. Shaw was a native of Ontario, and from 1888 to 1893 was instructor in the Ontario Agricultural College. He was the author of several text-books covering a wide range of agricultural topics.

Missouri Fruit Station.—F. W. Faurot, whose resignation as extension assistant professor of horticulture at the University of Missouri has been recently noted, has been appointed director.

Nebraska University.—C. W. Pugsley, director of the extension service, has resigned to become editor of *Nebraska Farmer*, and was succeeded July 14 by Charles E. Gunnels, formerly State leader of county agent work.

Nevada Station.—The station is planning a study of methods of increasing hay production in the Humboldt Valley, largely by improved methods of irrigation and cultivation, and in cooperation with the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture.

Cornell University and Station.—The summer session of the College of Agriculture had an enrollment of 334 persons. At the request of the State authorities a special course in agriculture for vocational teachers was offered, with a registration of 20. This course was open only to persons not in the draft and experienced in farming.

Dr. V. B. Stewart, assistant professor of plant pathology and plant pathologist, has accepted an appointment in the Bureau of Plant Industry of the U. S. Department of Agriculture and is engaged in work on the pathological inspection of vegetables. E. R. King, assistant professor of entomology, has been commissioned second lieutenant in the Aviation Corps.

North Carolina Station.—Through a State appropriation the station has added about ten offices to its quarters in the building of the State Department of Agriculture.

The recent establishment of a sheep experimental farm in the mountain section of Mitchell County, in western North Carolina, has materially enlarged the facilities of the station for studying sheep under actual farm conditions. The farm is in charge of W. R. Radford.

Dr. J. Kemp Plummer, soil chemist, has been given leave of absence for the period of the war to work on the manufacture of explosives.

North Dakota College and Station.—Dr. P. F. Trowbridge, head of the department of agricultural chemistry in the Missouri University and Station, has been appointed director. Dr. H. L. Kraybill, assistant physiologist in the Bureau of Plant Industry of the U. S. Department of Agriculture, has been appointed chemist in the station, to succeed W. L. Stockham, resigned to accept a position with this Department. Other appointments include Miss Cecil Yampolosky and Dr. Wanda Weniger as assistant botanists and plant pathologists, and Miss Ada Lewis as assistant professor of home economics.

Ohio Station.—L. L. Rummell has resigned as editor to become associate editor of the *Ohio Farmer*.

Pennsylvania College and Station.—R. S. Smith, assistant professor of agronomy and assistant agronomist, resigned June 1. J. W. Miller, assistant professor of botany and assistant botanist, has been granted leave of absence to engage in military service. Recent appointments include J. W. Mitten as assistant in dairy husbandry and W. S. Beach as instructor in plant pathology research at the field laboratory at Bustleton, effective June 1; and R. G. Bressler as professor of rural sociology, F. T. Struck as associate professor of agricultural education, and George Wehrwein as associate professor of rural economics, effective September 1.

South Dakota College and Station.—The new poultry building is under construction. E. L. Dakan, recently appointed assistant in poultry husbandry at the Missouri Station, has been appointed to take charge of the poultry department, and it is expected to begin experimental work at an early date.

Reginald Sherwood, assistant professor of chemistry and assistant chemist, and George Gilbertson, instructor in entomology, are now in military service.

Tennessee University and Station.—Plans are being prepared for a central administration building, to cost about \$500,000, and an armory building, to cost about \$150,000.

Provision has been made for the establishment of a new department to take charge of activities under the Federal Aid Vocational Education Act.

The forty-fifth annual session of the East Tennessee Farmers' Convention was held at the station farm, May 14-16, with an attendance of approximately 3,000 persons. The program consisted almost entirely of topics bearing on war activities, and action was taken whereby the entire membership fees of the year, aggregating about \$1,000, are to be devoted to the purchase of bonds of the Fourth Liberty Loan.

Capt. William Rule, secretary of the board of trustees, has resigned after 50 years of service on the board and has been succeeded by Thomas D. Morris, treasurer of the board. Captain Rule has been given the honorary degree of Master of Arts.

Utah College and Station.—The new live stock building has recently been completed but is being used as a barracks for soldiers stationed at the college for technical training.

A department of range management has been established in the college and station, in charge of Raymond J. Becraft.

Virginia Station.—E. T. Batten, superintendent of the Nansemond County Substation at Holland, has been called for military service.

Virginia Truck Station.—Albert White, assistant horticulturist, resigned July 15 to enter military service.

Wisconsin University and Station.—J. L. Tormey, associate professor of animal husbandry and animal husbandman, has resigned to become field man of

the American Shorthorn Breeders' Association. E. R. McIntyre, assistant in agricultural journalism, has resigned to become associate editor of *Wisconsin Farmer*.

Wyoming University.—Dr. S. K. Loy has resigned as professor of chemistry to engage in commercial work. Miss Greta Gray, of the Kansas State Normal School, has been appointed head of the department of home economics.

United States Food Administration.—Dean H. L. Russell has returned to the University of Wisconsin. His duties have been divided between Dean W. R. Dodson, of the Louisiana University, who will deal with matters of joint interest to the Food Administration and the U. S. Department of Agriculture, and E. S. Brigham, commissioner of agriculture of Vermont, who will head the butter and cheese section.

Studies of Instruction in Vocational Agriculture.—A cooperative agreement has been adopted between the U. S. Department of Agriculture, the Bureau of Education, and the Federal Board for Vocational Education respecting the studies relating to instruction in agriculture authorized by the Federal Aid Vocational Education Act. These studies, which under the terms of the act may be made in cooperation with or through the Department of Agriculture or the Bureau of Education, are to be carried on under the direction of the Federal Board. A committee representing each of the three agencies is to be formed to consider and recommend projects to the Federal Board. Investigators under approved projects may be detailed by the Department of Agriculture or the Bureau of Education to the Federal Board or representatives of the board may be detailed to cooperate with the other departments in making the studies. The results are eventually to be published by the Federal Board.

Agricultural Education in Mysore, India.—Three grades of agricultural education are being offered in Mysore and meeting with popular success, viz, (1) higher education, in the English language, leading to a diploma at the Hebbal School; (2) a somewhat lower grade of training given at the vernacular school at Chikkannahalli; and (3) rural science classes in selected rural vernacular schools sanctioned by a Government order of March 22, 1916, which aims at combining some agricultural training with elementary education. Four such schools were started recently, the work being under the supervision of a rural science supervisor who visits each school once a week and who is under the direction of the Deputy Director of Agriculture. The head masters of these selected schools had taken a course in agricultural training in the Mysore Normal School, followed by a course in May and June at the Hebbal School under the direction of the rural science supervisor. It is proposed to continue these vacation courses for teachers who are to give instruction in agriculture in the rural schools.

Agricultural Rehabilitation in France.—According to a letter printed in *Breeder's Gazette* from C. N. Arnett, now on leave from the Montana College and Station, a 500-acre farm at Ferme le Courbat, Le Liege, Indre et Loire, France, has been leased by the American Red Cross as an agricultural center for the reeducation of French mutilated soldiers. Barracks and farm equipment have been provided, and it is expected to accommodate from 125 to 150 men at one time. Courses in agriculture of 3, 6, and 12 months' duration are contemplated, including both lectures and practical work. It is estimated that about 65 per cent of these men came originally from farms and it is hoped in this way to restore them to the land and so help solve the future agricultural problem of France.

New Experiment Station at Guadeloupe, French West Indies.—This station has been recently organized by the Syndicat des Fabricants de Sucre of Guade-

loupe with the special object of improving sugar-cane yields in the island, which is one of the largest producers of sugar in the Lesser Antilles. The different types of soil will be studied, and experiments with tillage, liming, manuring, etc., will be carried out, along with the testing of different varieties of cane—both imported and locally grown. In addition, experiments will be undertaken with rotation crops, green manure crops, forage and pasture crops, etc.

The scientific staff at present consists of a director, who is also in charge of the entomological and pathological work, an assistant director, who is also chemist, and two field assistants. The director is J. Sydney Dash, a graduate of Macdonald College, who has been connected with the sugar-cane work of the Department of Agriculture, Barbados, for a period of eleven years. The assistant director is Charles T. Alder, previously assistant chemist at the St. Croix Experiment Station.

Experiment Station of Agricultural Bacteriology of Crema, Italy.—This station was founded in 1914 as a corporate body by a royal decree, with funds supplied by the agricultural ministry. During the last year it has had an additional grant of \$12,000, besides its original fund of about \$30,000.

The station has been engaged chiefly in continuing the studies of agricultural bacteriology which were begun in the laboratory of agricultural bacteriology belonging to the Lodi-Creamery Station and has kept the same laboratory personnel. Special prominence has been given to three problems: (1) The conservation of forage in the silo by mechanical pressure (in this particular type of silo the forage is not subjected to heating since it is entirely closed from the contact of air); (2) the making of Italian cheeses with pasteurized milk and selected lactic ferments; and (3) the preparation of lactic ferments for therapeutic uses.

The station has thus far issued bulletins dealing with silos with mechanical pressure and the lactic ferment in therapy.

The station staff consists of 15 persons, with Dr. Franco Samarani as director and Dr. Carlo Bianchini chemist and vice-director.

New Journals.—The *New Zealand Journal of Science and Technology* is being published bimonthly by the New Zealand Board of Science and Art as a medium for the publication of papers contributed by the Government departments and others and for the present of some articles of more popular nature. Longer scientific papers are to be issued as bulletins of the board, but credited to the Government department from which they originate. Existing serial publications, such as the *Journal of Agriculture* are not affected by the new arrangement, but it is hoped to bring together and render more accessible a considerable amount of material hitherto widely scattered in pamphlet form, parliamentary papers, etc.

Archivos da Escola Superior de Agricultura e Medicina Veterinaria is being published by this school, located at Pinheiro, State of Rio, Brazil. The initial number contains a catalogue of the species of Cholina of the Curculionidæ, by Dr. A. Da Costa Lima, chief of agricultural entomology.

Occasional Notes is being issued from time to time by the Royal Agricultural Society of Great Britain, with a view to getting before the public more promptly information which has heretofore been published only in the annual reports of the society.

The Secretary of Agriculture of Cuba has established *Revista de Agricultura, Comercio, y Trabajo* as the official organ of the department and with Felix Callejas as editor. It consists chiefly of articles of general agricultural interest and official notices.

La Revista Agricola is being published monthly as the official organ of the Direction of Agriculture by the Secretary of Works of Mexico, succeeding the

monthly bulletin previously issued. The initial number contains a variety of brief articles, including several on the cultivation of sisal, a description of the plant propagation and acclimatization gardens, the use of tractors in Mexico, farm separators, etc.

Revista del Instituto Bacteriologico is a quarterly being published at Buenos Aires by the Bacteriological Institute of the Argentina National Department of Health. It consists mainly of scientific contributions along the lines of pathological bacteriology.

Revista Medico-Veterinaria is the monthly organ of the College of Veterinary Medicine of São Bento, Brazil. The initial numbers contain several articles reporting experimental work carried on at the institution.

Zoopathologica is being published by the New York Zoological Society as a medium for its scientific contributions on the diseases of animals.

Miscellaneous.—The report of a committee appointed in Great Britain in 1916 to inquire into the position of natural science in the educational system is summarized in a recent issue of *Nature*. Advanced ground is taken as regards the desirability of greater attention to scientific training in the elementary and secondary schools. The committee, however, reports that specific instruction in agriculture or agricultural science should not be given in these schools, "though in favorable circumstances a rural bias may be given to the work of a secondary school. All county educational authorities, acting either singly or in co-operation, should furnish well-equipped farm institutes for their areas."

The London *Times* announces that the Royal Agricultural Society is endeavoring to supplement its long continued studies at Woburn by observations in other localities. Members of the society are being invited to cooperate in experimental work which, according to the preliminary announcement, will include tests of the continuous growing of grain, green manuring, unexhausted manurial values, the use of lime, treatment of pastures, and calf raising.

A series of short courses is being carried on at the University of British Columbia for returned soldiers. A course in fruit growing was attended by 44 returned men and one in agronomy and animal husbandry by 48. A course in agriculture and farm work began July 1 to continue for from three to six months. Requests have also been made for short courses in poultry keeping, vegetable gardening, apiculture, and dairying.

The senate of the University of New Zealand has agreed to include agriculture among the subjects for the ordinary B. A. and B. S. degrees. It has recommended also that for the purpose of encouraging the study of forestry the university appropriate \$730 a year for three years for a traveling scholarship in forestry, provided that the Government contribute a like sum and make some arrangements for the employment in the forestry department of the scholar on the expiration of his scholarship.

The agricultural school and experiment station near Panama City, Panama, started in 1915, has been closed for lack of funds. Dr. B. H. A. Groth, formerly of the New Jersey Stations, who has been in charge of the school and station since its establishment, has returned to this country.

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A writer in *Science* directs attention to the preface of a new book by an Italian mathematician in which the author points out the opportunity of those whose age and strength do not permit them to offer arms to their country to "work for its scientific emancipation." This presents a thought which is perhaps worth considering, and specifically in connection with experiment station activities, where the question of duty contends in the breast of a large body of the workers.

None of these workers probably questions the ultimate value to his country of the studies he is conducting in the station, but continuance of it may not have occurred to him as representing a form of patriotic service in helping to place his country on a high plane of scientific freedom and influence. The fact that such service is not given as wide public recognition at the moment matters little if the correct viewpoint is maintained, for its vital importance and its real ultimate significance will be understood. It may take more courage to continue than to give up, but not more faith and confidence in the outcome if the worker is right minded.

The war has made us see many matters in a new light, and especially as bearing on the relations of nations. The world strength and influence of a nation is not measured alone by its wealth and commercial resources and force of arms. Its position in science as an original source of knowledge and a leader of thought and progress is an element of no small importance in giving it authority and commanding respect. Conspicuous activity in science not only advances a nation internally as a direct result of its accomplishment and its broad influences, but it is one of the important elements in determining the rank of a country among nations and respect for its views. It is one of the elements that make for preeminence.

A nation which can control the principal avenues of scientific communication between nations and continue to supply the leading handbooks and treatises through a long period has at its disposal an unusual opportunity for presenting its views, securing prominence for them, and thus exercising a profound influence on current science and theory throughout the world. Such position gives it a kind of power

which is more looked up to and acknowledged in time of peace than its potential force of arms. This we have well seen.

A contest for supremacy does not stop with such boundaries as territory, trade, and allegiance. It recognizes the advantage of influence and leadership, as well as of absolute authority. It naturally seeks to retain that advantage, to dominate world knowledge, to be regarded as the Nestor of science, to propagate the view of its pre-eminence in that field and of the authority of its outgivings.

To gain a commanding authority in science is not less to be sought than power in other directions, and it is quite as potent as a means of elevation. This is clear from the recognized dependence upon science of progress in industry and human welfare. A people who can dominate research and scientific thought can in large measure influence human development, industrial and intellectual. They become masters in a large sense, with power to exercise a control through the forces of influence, competition, priority, and leadership.

Authority secured through preeminence in science implies a dependence and inferiority or backwardness of those brought under it which inevitably restricts national development and independence of thought. This is true without the exercise of any oppressive or restraining measures. No progressive country can long forge ahead in its development and keep pace with the nations of the earth if it depends on borrowed or transplanted science. It must itself be an active and effective contributor, for it has its own special problems which it can not wait upon other countries to solve. It must develop competent specialists and experts capable of acquiring as well as of adapting and interpreting.

This is peculiarly the case in agricultural matters. Not only the proper applications of world knowledge need to be determined by careful study with reference to the local situation, but fundamental inquiries must be fostered which reach out into the unknown, or progress will be held back. Much of the task of scientific development in agriculture depends upon activity of this nature. No country can afford to be dependent upon another for it. If it is, it will necessarily lag behind and it is likely to make many costly mistakes.

It is recognized, of course, that science is not restricted by any national boundaries. It is world-wide, free, and its acceptance and incorporation into the knowledge of a nation is restricted only by the avenues of communication and the attitude of its people. But the provision for scientific investigation and publication should be a national one, since it is a matter of national interest and life and growth. Second-hand science is tardy, and does not take the place of original work. It develops neither the spirit nor the forces for

investigation. These are national assets and largely of a nation's making. The pursuit of research lends a certain element of zealous competition and pride in the scientific advance of one's own country.

The power of knowledge has been given remarkable demonstration by Germany. Her science in agriculture has alone enabled her to wage four years of warfare cut off from the rest of the world as effectively as possible. All of the principal countries opposed to her have acknowledged her superiority in acquiring and incorporating in practice information based on research, which has made her agriculture in many respects the best example of scientific agriculture in any country. The influence of her teachings and her example has been unparalleled.

In this country we have frankly acknowledged in the past that much of our agricultural science was borrowed from other branches and other countries, notably Germany. For a long time German-made science and German-made theories relating to the principles of agriculture and their practical application dominated all others. They gradually assumed a degree of authority which it has been difficult to overthrow even when our own work has shown them not to be applicable. The extent of the activity and the leadership of the country in this field, and the authority with which they were set forth, led contributions and theories which emanated from its workers to be readily accepted and regarded as representing the last word.

The situation was further emphasized by the fact that the results of this outstanding activity in research and discussion were reported in the standard journals of that country, which were frequently the leading journals of science in the world. German scientific literature was long the most important means of communication, and maintained its supremacy in spite of being in a difficult foreign tongue. It tended to make the German language the language of science. The theory and principles developed out of this investigation were promptly embodied in treatises and handbooks which by reason of the painstaking care in their preparation and frequent revision have remained standard for a long period, and even in their translation have retained the influence of their origin.

These circumstances, together with the historical development of agricultural science and the striking examples of its application, operated to give German science a preeminence in agricultural theory and practice. For a long time at least it dominated opinion, and investigators were slow to controvert it or to secure the acceptance of diverse opinions. Witness the tenacity with which Wolff's feeding standards persisted, even though they were based on infinitely less data than were represented by the many tests of them. The question of nitrogen assimilation from the air was a hotly disputed point, despite the experiments of Lawes and Gilbert in England,

Atwater in this country, and others, until Hellriegel reported his important findings which were stamped as classic and accepted the world over. In all research the deriving of conclusive evidence is of prime importance, but the courage and force of the investigator's convictions and confidence of his audience are only secondary.

Despite the great influence German methods and results have rightfully had on our own agricultural investigation and deductions, it is important that we should not subordinate our activities or be tied to theories and impressions of the past. While it is difficult to shake off the influence of German science upon our work and theories and upon the public mind, and this is only important as far as it impairs our scientific freedom, the solution of many of our peculiar problems requires a measure of independence and self-confidence which are now warranted.

Results and conclusions need to be assessed at their real value and significance as judged by the light of our own standards and conditions, irrespective of the source. With a disposition to accept without prejudice the results of applications of investigation which fits our conditions, it is important to exercise independence of thought and criticism, and to develop a measure of self-reliance commensurate with our own opportunities and vast needs.

The scientific activity of this country in matters relating to agriculture has grown tremendously in the past 20 years. It may be well for us to recognize frankly that in a considerable number of lines more work of an original and epoch-making character is being done here than in any other country, and that this places us in a position where we need not be dependent on others for the method and the fundamentals if we exercise the full measure of our opportunity. In a number of conspicuous lines workers in this country are doing as high grade of investigation and on as large a scale as in any part of the world; and in some lines it is probably not too much to say that they are in the lead. This a reason for confidence and an indication that it should not be necessary to wait upon other countries to do the pioneer work for us in research or application.

A great deal of American research has now gone beyond the views current abroad and has entered the field of original inquiry. Some of it is at variance with teachings we have accepted in the past. This is no stricture, for we need theories and hypotheses as means of advancing knowledge from point to point, and some of these will inevitably be relegated to the rubbish heap; but the danger lies in following somewhat blindly from force of habit, and accepting deductions and applications made under a quite different set of conditions. Interpretation is no less important than acquiring the fundamental facts. Because agricultural science is a composite science, and largely

an applied one, research and especially interpretation and generalization in it need to be made with great care and with full understanding of prevailing conditions.

Not all of our borrowed or transplanted science has been found to apply. Theories and conclusions in which great confidence was placed because of their source have been woven into the fabric of our theory and principles and urged in practice only to be found later not wholly applicable under American conditions. Modifications have proved to be necessary, sometimes even extending to the basic principles. This is doubtless partly our own fault, but it indicates the danger of accepting and applying unquestioningly work from another source and holding to it tenaciously after our own experience has cast doubt upon it.

Illustrations of lines in which American workers are conspicuous and are in some instances in the ascendancy are found in such subjects as the study of the principles of breeding, the chemistry of the various constituents of foods and feeding stuffs and their special nutritive relations, the study of diseases of plants and effective means of combating them, the control of insect pests based on life history studies and the theory of the action of sprays and other remedies, the functions and relations of water and fertilizers in plant growth, etc. In these and many other lines the force and the facilities have been developed, and in large measure the support which makes their continued pursuit possible with public funds.

If therefore in some of these matters a point has happily been reached where we can more largely stand alone, and where our investigators have become leaders and not followers, there is the more reason why this position should be maintained and extended. There is no reason why we should be dominated or overshadowed by the knowledge and science of another people. The intellectual independence and the development needs demand that we shall be scientifically fit and maintain our research in the front rank.

We recognize the international character and spirit of science. It is a neutral subject. We accept the new contribution on the basis of its actual merit as nearly as it may be assessed, without respect to its source. But it is well to remember that there is no hierarchy in science, no single source or group to which it is committed or to which we are to look for it. Theory and discovery are not necessarily worthy of more weight because they come from a source which has been our most conspicuous supply in years gone.

In the new world which will exist after the war the United States, a member of a fraternity of nations, ought to contribute to the advancement of human knowledge in proportion to its population and wealth. The object will not be to gain knowledge for the purpose

of dominating the rest of the world but for the sake of making our proper contribution to human welfare. We are fortunate in having established a great system of agricultural research on a public foundation and largely connected with institutions for higher education, thus keeping it apart from political and commercial influences.

We have come to realize already some of the advantages to this country of its present position in agricultural investigation, and of means of dissemination provided by treatises and periodicals in our own tongue. It is quite possible that after the war scientific journals and handbooks in the English language, if maintained at sufficient grade to merit it, will find a wider market and a wider field of influence. We are now able to see that the advantage of preeminence in a line of science lies not alone in its benefit to the industry for which it is primarily developed, but in the prestige it may carry among men of science and in the family of nations.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Fruit juices, F. THOMPSON (*Delaware Sta. Bul.* 119 (1918), pp. 18, 19).—In the course of investigations on fruit juices an attempt was made to determine citric, malic, and tartaric acids by the effect on the rotatory power produced by uranium acetate or molybdic acid. Good results were obtained with pure solutions of the acids, but concordant results could not be obtained with natural fruit juices, owing probably to the influence on rotation of other substances in the fruit juice and to the fact that molybdic acid was reduced. Good results were obtained by Willaman's modification of the Pratt method for the determination of citric acid, previously noted (*E. S. R.*, 36, p. 317). Preliminary studies of the hydrogen-ion concentrations of the fruit juices at different stages of maturity gave surprisingly constant results, a fact which is considered an indication of the constant acidity that is probably maintained for the purpose of enzym activity.

The occurrence and significance of mannitol in silage, A. W. DOX and G. P. PLAISANCE (*Iowa Sta. Research Bul.* 42 (1917), pp. 353-364).—Previously noted from another source (*E. S. R.*, 37, p. 801).

The fruit of the *Asparagus officinalis*, N. E. HEHNER (*Chem. News*, 116 (1917), No. 3030, pp. 296, 297; *abs. in Analyst*, 43 (1918), No. 503, p. 60; *Chem. Abs.*, 12 (1918), No. 8, p. 817).—The following analytical data are reported: Percentage of sugar, 36.12; ash, 3.5; oil, 1.08; and protein, 1.56. The oil obtained was a semisolid mass having a specific gravity of 0.9005 and a saponification number of 178.57. A large amount of malic acid and a trace of citric acid were found. The percentage of ash constituents was as follows: SiO_2 , 2.53; Al_2O_3 , 0.98; Fe_2O_3 , 2.53; CaO , 3.52; MgO , 6.09; K_2O , 5.35; Na_2O , 8.73; and SO_3 , 7.91.

The analytical examination of the sweet chestnut (*Castanea sativa*), J. L. BAKER and H. F. E. HULTON (*Analyst*, 43 (1918), No. 502, pp. 32, 33).—The authors report the following analysis of the sweet chestnut: Moisture, 4.7 per cent; ash, 2.68; ether extract, 2.9; proteins ($\text{N} \times 6.25$), 7.44; reducing sugars as dextrose, 5.36; cane sugar, 9; starch (Lintner), 50.6; starch (taka-diastase), 41.08; pentosans, 3.06; crude fiber, 2.28; and matter soluble in cold water, 22.08 per cent. Unlike the horse chestnut (*E. S. R.*, 38, p. 410), there was but little evidence of diastatic activity.

Chemical tests of Manchurian soy beans, A. A. WILLIAMSON (*U. S. Dept. Com., Com. Rpts.*, No. 101 (1918), pp. 406, 407).—Chemical analyses of Manchurian soy beans and soy-bean cake are reported. The average oil content of standard beans has been as follows: 1912, 18.15 per cent; 1913, 18.22; 1914, 17; 1915, 17.25; and 1916, 16.94 per cent.

The study of copra and other coconut products, A. J. COX (*Philippine Jour. Sci., Sect. A*, 12 (1917), No. 2, pp. 49-53).—The author reviews briefly the work that has been done by the Bureau of Science at Manila on the coconut and its

products. A bibliography of investigations conducted and published by the bureau on this subject is included.

Copra and coconut oil, H. C. BRILL, H. O. PARKER, and H. S. YATES (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 2, pp. 55-86*).—This paper presents analytical and botanical data relative to losses in copra and oil due to the faulty production of copra and suggests means for improvement. The data show that unless the coconut meat is dried immediately after opening the nuts to a moisture content of approximately 6 per cent, it is attacked by various microorganisms which cause a loss in oil content, the extent of which depends upon the length of time the meat retains sufficient moisture for mold growth.

The four molds which constantly occur upon moldy copra and coconut meat are, in the order of the moisture content necessary for their growth, *Rhizopus* sp., or white mold; *Aspergillus niger*, or black mold; *A. flavus*, or brown mold; and *Penicillium glaucum*, or green mold. The moisture content necessary for the growth of these molds on copra and the resulting loss in oil are reported. A loss of from 30 to 40 per cent of oil may be expected in all copra which contains sufficient water (7 to 8 per cent) to enable brown mold to grow. When poorly dried copra is stored there is a marked rise in temperature and increase in carbon dioxide content of the atmosphere surrounding the copra, showing oxidation and consequent loss of oil.

The copra drying methods in use in the Philippines are described and a method involving the use of sulphur dioxide is suggested.

Methods for the production of pure coconut oil, H. O. PARKER and H. C. BRILL (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 2, pp. 87-94*).—The authors discuss the native methods of obtaining oil from fresh coconuts and describe improved methods which have been successful in laboratory practice.

In one method the meat is freed from the shell, ground fine, and subjected to the action of live steam for three hours in a cooking vat in which the material is violently agitated. The emulsion is strained off, the pulp pressed, and the combined liquids kept at a temperature of 15° C. for three hours. The oil separates from the water and solidifies. After being warmed to atmospheric temperature it is run through a filter press, then sterilized at 100° for 30 minutes, and stored in air-tight containers. Oil prepared thus is free from acidity and rancidity and has good keeping qualities.

The second method is a continuous process in which the meat is removed from the shell, dried to a moisture content of 10 per cent, and, while still hot, subjected to pressure for the removal of the oil. The press cake from the above method is white and clean and offers possibilities not only as a stock feed but for human consumption. It has the following composition: Water, 7.35 per cent; oil, 32.14; ash, 4.05; crude fiber, 37.12; and protein (N×6.25), 20.34.

Recipes for the preparation of food products from the meal are included.

The rancidity of Philippine coconut oil, H. C. BRILL and H. O. PARKER (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 2, pp. 95-110 abs. in Analyst, 43 (1918), No. 504, pp. 89, 90*).—This article discusses the various methods in use for measuring rancidity and presents analytical data leading to the following conclusions:

"The color tests with decolorized fuchsin and with diazobenzene sulphonic acid are not reliable tests for rancidity. High acidity of oils is not coterminous with rancidity. Steam distillation removes rancidity, but makes very slight changes in the acidity; neutralization with alkali and washing removes the acidity but not the rancidity. The Reichert Meissl number in the few cases

studied indicated no close relationship between this constant and the rancidity. No conclusions could be drawn from the magnitude of the iodine value. The soluble fatty acids show a relationship which indicates that this constant might be of value in an estimation of the rancidity of an oil. The acetyl value may be of value in indicating rancidity, but is not a measure of the degree of rancidity. The oxidizability number appears to be a good confirmatory test for rancidity, but a few samples of oils undoubtedly rancid gave low oxidizability values. However, where the value was high, the oil was always rancid."

Oxidation numbers of medicinal fats, G. ISSOGLIO (*Ann. Chim. Appl. [Rome]*, 7 (1917), No. 9-12, pp. 187-199; *abs. in Chem. Abs.*, 11 (1917), No. 18, pp. 2598, 2599).—The oxidation numbers (E. S. R., 37, p. 114) have been determined for medicinal fats of three classes, namely, glycerids of vegetable origin, such as olive, almond, and castor oils, and cacao butter; glycerids of animal origin, such as lard, mutton tallow, and cod-liver oil; and galenical preparations, including ointments and pomades. The following values of this constant are reported: Pure olive oil, 2.85 to 3.18; almond oil, 1.18 to 3.15; castor oil, 0.85 to 3.18; cacao butter, 3.81 to 4.93; purified lard, 0.58 to 1.12; purified beef fat, 3.25; fresh mutton fat, 6.48; rancid mutton fat, 25.26; benzoinated lard, 4.62; colorless cod-liver oil, 1.84 to 8.07; and reddish cod-liver oil, 20.4 to 38.42.

The author recommends that reddish cod-liver oil should not be used as a medicinal oil, as the color is almost always accompanied by a high oxidation number. The oxidation number should be included with the acidity number in the Italian Official Pharmacopœia to indicate the good keeping qualities of medicinal oils. The oxidation number for medicinal fats and for benzoinated lards should not exceed 10. A high oxidation number for mercurial pomades should be taken to denote a preparation obtained from rancid fats or, if the number be very great, the presence of turpentine.

Oil from rice polishings, F. GARELLI (*Ann. Chim. Appl. [Rome]*, 8 (1917), No. 9-12, pp. 109-114; *abs. in Jour. Soc. Chem. Indus.*, 37 (1918), No. 7, p. 187 A).—The practicability is discussed of extracting oil from rice polishings and of utilizing the oil for the production of soap, fatty acids, and glycerin and the press cake as a feeding stuff. Analyses are given of the oil obtained by extraction with petroleum ether and by pressing, of the rice polishings, and of the press cake. The cake is deemed superior to the original polishings for feeding purposes as it is more compact and consequently easier to transport, and contains less fat, which readily becomes rancid. With the commercial utilization of the oil its value as a by-product would be increased.

Study of foreign oils in castor oil employed (as a lubricant) in aviation motors, C. FRABOT (*Ann. Chim. Analyt.*, 22 (1917), No. 11, pp. 217-223; *abs. in Analyst*, 43 (1918), No. 502, pp. 40, 41; *Ann. Falsif.*, 11 (1918), No. 111-112, pp. 50-52).—Analytical data are reported of the principal constants of mixtures of castor oil and peanut oil of known proportions. The data show that of the usual constants the acetyl number alone has a low enough limit of sensibility (1 or 2 parts in 100) to be of value in detecting peanut oil in amounts less than 5 parts in 100.

Two methods are suggested for determining the amount of peanut oil in an adulterated castor oil. One depends upon the fact that an alcoholic solution of pure castor oil remains clear on cooling to -20°C ., while the addition of peanut oil causes turbidity at different temperatures corresponding to the amount of oil added; 1 per cent at -4 to -5° , 2 per cent at -2 to -3° , 3 per cent at 0° , 4 per cent at 3° , and 5 per cent at 5 or 6° . The second method consists in extracting the adulterant with petroleum ether, in which castor oil is relatively insoluble. Amounts of peanut oil of less than 1 per cent can be detected

in this way. The castor oil dissolves a small amount of the petroleum ether, the increase in volume being proportional to the purity of the oil.

Study of foreign oils in castor oil employed as a lubricant in aviation motors, C. FRABOT (*Ann. Chim. Analyt.*, 23 (1918), No. 1, pp. 7-11).—Variations in the results obtained for the solubility of castor oil in petroleum ether by the method noted above led to a study of the solvent power of fractions of the petroleum ether of varying boiling points and density. It was found that the solubility of castor oil in petroleum ether increases with the density of the solvent, while the solubility of the ether in the castor oil varies very little with the density. The author suggests that in using this method for detecting peanut oil in castor oil the petroleum ether should be freshly distilled and the fraction used which is obtained between 35 and 65° C.

The "Valenta number" as a discriminating test for oils and fats, P. J. FRYER and F. E. WESTON (*Analyst*, 43 (1918), No. 502, pp. 3-20, figs. 5).—The authors report a critical study of the Valenta number undertaken for the purpose of discovering the causes of discrepancies in results and the extent to which they operate. The test as originally proposed differentiated between oils and fats according to their solubility in glacial acetic acid, the method being to ascertain the exact temperature at which the clear heated solution showed the faintest trace of turbidity on being cooled.

As a result of the investigations, which are reported in detail with analytical data, two methods are described which are considered to give reliable results. In one method acetic acid is used as a solvent and in the other amyl and ethyl alcohols. In both methods the values are adjusted by reference to almond oil used as a standard. Diagrams are given showing the Valenta number with each method.

The results indicate that the alcohol method separates the butter fat and coconut groups and the rape oil widely from the rest, but does not discriminate the drying oils from the nondrying oils as distinctly as does acetic acid. It is recommended for testing arachis, rape, and linseed oils where high iodine values are of advantage, and for differentiating between coconut and palm-kernel oils. The turbidity temperature is more distinct with alcohol than with acetic acid. The acetic acid test is said to be rapid and useful for testing arachis, rape, and, to a less extent, olive and perilla oils, as well as for testing butter fat.

The method of enzym action, J. BEATTY (*London: J. & A. Churchill*, 1917, pp. IX+143).—In this monograph the author has summarized the chief results of modern research on enzymes and catalytic actions and has formulated an interesting hypothesis of ferment action based upon the power, common to all enzymes, of attracting H or OH groups in water and upon the power, specific to the ferment in question, of adsorbing some particular substance. He suggests that all enzymes must be composed of one substance exercising the specific and another the general function.

The book contains an introduction by E. H. Starling.

Studies in the nitrogen metabolism of bacteria, H. J. SEARS (*Chicago: American Medical Assoc.*, 1916, pp. 35, figs. 5).—This is a study of the nitrogenous constituents of the food supply of bacteria and a chemical examination of the products of the action of bacteria upon these food substances. Data are given of the production of amino acid and ammonia by various organisms in peptone, in meat-extract peptone, and in gelatin with and without the addition of glucose to the medium. The possible formation by bacteria of urea, uric acid, allantoin, creatin, and creatinin was also studied. The general results were as follows:

Peptone cultures of most bacteria give fluctuating concentrations of amino acid, showing that these bodies are formed and broken down continuously by

the organisms. Exceptions to this rule are a few strongly proteolytic organisms, such as *Bacillus pyocyaneus*, *B. subtilis*, *Spirillum cholerae*, and *S. metchnikovii*, the cultures of which show steadily increasing concentrations of amino acid. Most species, when grown in peptone or peptone gelatin media, appear to utilize the simpler compounds of nitrogen before attacking the protein or peptone, and also seem able to utilize ammonium salts in small amounts. The protein-sparing effect of glucose is shown by the concentrations of free ammonia and of amino acid. Practically the same amount of ammonia- and amino acid-production is shown by the organisms on peptone solutions containing 5 per cent gelatin as on pure peptone solution, except in the case of organisms having a gelatin-liquefying power. Evidence is given in most cases of the presence of large amounts of nitrogenous products intermediary between amino acid and ammonia.

Urea, uric acid, and allantoin could not be found. A few species of bacteria are capable of producing creatin and creatinin in sugar-free peptone cultures. Many more are capable of producing these substances in media containing glucose.

Fat-free lactose-free extract, C. PORCHER and R. DAGE (*Ann. Falsif.*, 10 (1917), No. 107-108, pp. 458-470).—From numerical data submitted, the authors criticize the conclusions of Ackermann, previously noted (E. S. R., 36, p. 614), that the ratio between lactose-free solids and lactose is of value in judging milk. In the case of a milk suspected of coming from animals affected with mastitis, determinations should be made of lactose, total ash, sodium chlorid, total protein, and casein, and, if possible, microbiological and cytological examinations. Whenever, all adulteration having been excluded, chemical analysis shows that the composition of the milk examined is weak, search should be made for a more than probable pathological origin by studying the general and local health of the animal furnishing the milk.

The estimation of nonprotein nitrogen in blood, I. GREENWALD (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 97-101).—The various methods in use for the precipitation of protein in the estimation of nonprotein nitrogen in the blood are discussed.

Trichloroacetic acid in 5 per cent solution without the addition of kaolin, previously recommended (E. S. R., 37, p. 14), has been found to give satisfactory results and is considered by the author to be the most convenient precipitant to employ. The nitrogen is determined by distillation and titration, although the use of trichloroacetic acid may be combined with the direct nesslerization process of Folin and Denis (E. S. R., 36, p. 316).

A new method for the direct nesslerization of ammonia in urine, J. B. SUMNER (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 37-41).—The authors recommend the use of copper hydroxid as rapid and easy and offering special advantages for time saving over the permittite method of Folin and Bell (E. S. R., 37, p. 311). The method is as follows:

Pipette into a large test tube exactly 10 cc. of copper sulphate solution containing 298 gm. of pure crystallized copper sulphate per liter, 15 cc. of urine, and 10 cc. of 2.03 N sodium hydroxid solution. Stopper immediately and shake vigorously to mix the materials thoroughly. Filter through an 11 cm. filter paper, covering the funnel with a watch-glass to prevent evaporation. Pipette into a 100 cc. volumetric flask the amount of filtrate that a preliminary test has shown to be advisable. Add 1 drop of a saturated solution of Rochelle salt to prevent precipitation of the trace of copper that is present. Dilute and nesslerize with 10 cc. of the Nessler solution of Folin and Denis. The preliminary test is made by nesslerizing a minute portion of the filtrate from the copper hydroxid and roughly comparing the color with a set of permanent

standards prepared from a solution of ferric chlorid and cobalt nitrate and standardized against definite amounts of nesslerized ammonia nitrogen.

Tables are given showing the values of the standardizing solution and indicating the accuracy of the results obtained by this method.

A method for the determination of sugar in normal urine, S. R. BENEDICT and E. OSTERBERG (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 195-201; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 21, pp. 1567, 1568).—The method is an adaptation of the colorimetric procedure of Lewis and Benedict¹ for the determination of sugar in blood. The process consists of (1) the preliminary precipitation of interfering substances from the urine by excess of mercuric nitrate in the presence of a slight excess of sodium bicarbonate and subsequent removal of the mercury with zinc dust, and (2) the determination of the sugar in the filtrate, as follows:

The special reagents used are (1) mercuric nitrate solution, prepared by adding to 160 cc. of concentrated nitric acid 220 gm. of mercuric oxid, heating the mixture to boiling, and adding 60 cc. of 5 per cent sodium hydroxid solution; this is made up to 1 liter and filtered; (2) picrate picric acid solution, prepared by adding to 500 cc. of 1 per cent sodium hydroxid solution 36 gm. of picric acid and 400 cc. of hot water. After the picric acid is dissolved the solution is cooled and diluted to 1 liter.

To 15 or 20 cc. of urine in a 500-cc. beaker is added an equal volume of the mercuric nitrate solution. Sodium bicarbonate is then added in small quantities until frothing ceases and the mixture reacts alkaline to litmus. After filtering through a dry filter paper a pinch of zinc dust and 1 or 2 drops of concentrated hydrochloric acid are added to the filtrate, which is again filtered. From 1 to 4 cc. of the final filtrate is measured into a test tube graduated to 12.5 and 25 cc., 1 cc. of 20 per cent (anhydrous) sodium carbonate solution and 4 cc. of the picrate-picric acid solution are added, and the tube plugged with cotton and placed in boiling water for 10 minutes. After cooling, the solution is made up to the 25-cc. mark or to 12.5 cc. if the amount of sugar present is very small, and the colored solution is matched in a colorimeter against a standard prepared by treating 1 mg. of glucose in 4 cc. of water as the final filtrate was treated or by a permanent standard of picramic acid solution or potassium dichromate. To determine the glucose or fermentable sugar in the sample of urine it is necessary to make a second determination on the sample after fermentation of the urine with yeast.

The method is considered to give figures which represent very nearly the true sugar content of normal urine. If applied to diabetic urines the samples must be diluted from 10 to 100 times before analyzing.

A modification of the Lewis-Benedict method for the determination of sugar in the blood, S. R. BENEDICT (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 203-207).—The method involves the use of the picrate-picric acid solution and standards mentioned in the previous paper. The procedure is as follows:

Two cc. of blood is drawn into an Ostwald pipette containing a little powdered potassium oxalate, and discharged into a large test tube graduated at 12.5 and 25 cc. The pipette is washed with distilled water, the washings being added to the blood. The mixture is made up to the 25 cc. mark with the picrate-picric acid solution and filtered through a dry filter. Exactly 8 cc. of the filtrate is measured into another graduated test tube and 1 cc. of 20 per cent (anhydrous) sodium carbonate solution is added. The tube is plugged with cotton, immersed in boiling water for 10 minutes, and the determination finished as outlined in the previous paper. The glucose standard is made by treating 0.64 mg. of glucose in 4 cc. of water with 4 cc. of the picrate-picric acid

¹ *Jour. Biol. Chem.*, 20 (1915), No. 1, pp. 61-72.

solution and 1 cc. of the carbonate. This is heated for 10 minutes in boiling water and diluted to 12.5 cc.

Results obtained by this method duplicate very closely those obtained by the original Lewis-Benedict method. The necessity of further concentration is avoided by the use of the very strong solution of picric acid. In the determination of the sugar content of pathological human blood it is suggested that it may be advisable to employ the preliminary precipitation of possible interfering substances by mercuric nitrate and sodium bicarbonate as described for urine in the previous paper.

Arsenical glucoses, A. KLING (*Ann. Falsif.*, 10 (1917), No. 107-108, pp. 438-450, figs. 4).—A comparison is reported of the methods most frequently employed for detecting arsenic in glucose for the purpose of determining the degree of exactness and sensibility of each method.

A rapid method for the selection of sulphuric acid for the manufacture of glucose, A. KLING (*Ann. Falsif.*, 10 (1917), No. 107-108, pp. 451-453, fig. 1).—An apparatus for the determination of arsenic in sulphuric acid by means of mercuric chlorid paper is described and illustrated diagrammatically.

Vegetable decolorizing carbons and their use in the cane sugar industry, F. W. ZERBAN (*Louisiana Stas. Bul.* 161 (1918), pp. 5-38, figs. 2).—This publication summarizes the important data on the subject, including the results of some laboratory and sugarhouse tests made at the Louisiana Sugar Station during the grinding season of 1917-18.

Laboratory experiments on the decolorizing effect of varying percentages of Norit on juices clarified by different methods show that the least colored juices are obtained and the greatest saving of Norit effected by clarifying with lime and phosphoric acid. The juices, however, do not settle as quickly as when treated with lime and sulphurous acid. If the latter reagents are used the addition of a small quantity of phosphoric acid with the Norit to the clarified juice will cause a great improvement in color.

Laboratory and factory experiments to determine the effect of rice carbon on juice clarified in different ways gave the following results: The color was more easily removed by the carbon from the unboiled juice than from the sirup or molasses. No measurable difference was noted in the viscosity of treated and untreated samples of the juice or sirup, although the treated sirups seemed to boil more freely than the untreated. There was a marked improvement in the purity of the sirups and juice, the extent depending on the method of clarification and amount of carbon employed. No inversion was caused by the carbon treatment nor was there any marked change in the quantity of free acids. The average total nitrogen content of the molasses from treated products was 3.9 per cent lower than that from the untreated. A small reduction in ash and gums was noted.

These results lead to the conclusion that a larger amount of high-grade sugar would be obtained by the use of decolorizing carbons than without them. The present data are deemed insufficient to determine whether it would be better to use the carbon directly on juices and sirups in the raw sugar factory or to make raw sugar first and then refine it by means of carbon. The advisability of using either of the two processes will be largely determined by the difference in price of dark and light molasses, which varies with different localities.

Contribution to the study of alcohols in cider, E. KAYSER (*Bul. Soc. Agr. France*, 1917, Nov., pp. 321-323).—This article reports data on the analytical constants of cider obtained under controlled laboratory conditions. It gives evidence that the presence of higher alcohols and ethers may be caused by secondary fermentation, and that under the same conditions fermentation does not always take place to the same extent.

Clarification of wines: Spontaneous and artificial, L. MOREAU and E. VINET (*Rev. Vit.*, 47 (1917), No. 1222, pp. 341-345).—In this article are described various processes for clarifying wine, including clarification by milk, casein, egg white or egg albumin, fresh and powdered blood, gelatin, and fish glue or isinglass. The last reagent is considered the most satisfactory by the authors, and the method of its use is described in detail.

METEOROLOGY.

Nocturnal cooling of the lower layers of the air, H. PIERROTIN (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 15, pp. 616, 617; *abs. in Rev. Sci. [Paris]*, 56 (1918), No. 9, p. 283).—From a review of observations from various sources, the author concludes that the coefficient of radiation decreases decidedly with elevation and is reduced almost one-half at an altitude of 300 meters. He concludes that the decrease is not attributable to lowering of temperature and atmospheric pressure as indicated by the results of laboratory experiments.

The "old fashioned" winter of 1917-18, C. F. BROOKS (*Geogr. Rev.*, 5 (1918), No. 5, pp. 405-414).—The characteristics of this unusual winter are described and the causal sequence of events during the winter is explained. It is suggested that the unusual conditions "may have been caused by a sun hotter than usual which brought on self-perpetuating cold waves and droughts."

Climatological data, M. B. SUMMERS ET AL. (*Alaska Stas. Rpt. 1916*, pp. 81-91).—Tabular summaries are given of monthly and annual normal temperature and precipitation at 38 stations in Alaska for 19 years, a comparison of weather (temperature, rainfall, and clear days) at 12 stations during summer months of 1915 and 1916, and monthly summaries of observations on temperature, precipitation, and condition of the weather at 25 stations during 1916.

Meteorological observations, J. S. STEVENS (*Maine Sta. Bul. 268* (1917), pp. 315, 316).—A monthly and annual summary of observations at the University of Maine on temperature, precipitation, cloudiness, and wind movement during 1917 is given. The mean temperature for the year was 42.17° F. as compared with an average of 42.75° for 49 years; the total precipitation was 44.06 in., the snowfall 117.25 in., the number of clear days 216, the number of cloudy days 88, and the total movement of wind 51,414 miles.

[Meteorological observations], D. A. SEELEY (*Ann. Rpt. Sec. Bd. Agr. Mich.*, 56 (1917), pp. 189-204).—Daily and monthly summaries of temperature (maximum, minimum, and mean), precipitation, cloudiness, and sunshine, and monthly summaries of pressure (maximum, minimum, and mean), wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos) at East Lansing, Mich., are given for the year ended June 30, 1917.

Meteorology report, 1916, H. G. KNIGHT and W. L. HESS (*Wyoming Sta. Rpt. 1917*, pp. 158-161).—Monthly summaries are given of observations at Laramie, Wyo., during 1916 on temperature, pressure, precipitation, humidity, sunshine, and wind movement. The highest temperature was 86° F., June 28 and July 3 and 5; the lowest, -25°, November 13. The total precipitation was 10.18 in. The highest relative humidity was 100 per cent, October 19 and December 10, 13, and 20; the lowest, 13 per cent, November 5. The greatest velocity of wind was 60 miles per hour, March 6. The first killing frost was October 8.

SOILS—FERTILIZERS.

Aluminum as a factor influencing the effect of acid soils on different crops, B. L. HARTWELL and F. R. PEMBER (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 1, pp. 45-47).—Further studies are briefly noted along lines of investigation in progress at the Rhode Island Experiment Station, and previously described

(E. S. R., 20, p. 126; 32, p. 622), in an effort to determine the relative importance of aluminum and of free acid as factors influencing the plant growth on acid soils.

The addition of aluminum sulphate, equivalent to the amount of aluminum found in the extract of an acid soil, to a nutrient solution, depressed the growth of barley seedlings much more than that of rye seedlings, but the same amount of sulphuric acid unaccompanied by aluminum depressed the rye as much as the barley. Since the hydrolysis of the aluminum sulphate gave about one-fourth the hydrogen-ion concentration of that resulting from the free acid, aluminum was deemed to be the principal cause of the depression in the growth of the barley, and the conclusion was reached that the two seedlings were affected by the nutrient solution containing aluminum the same as they were by an aqueous extract of an acid soil.

A moist acid soil upon which most kinds of plants were unable to grow was kept in intimate contact for about two weeks with acid phosphate at the rate of 28 tons per acre, after which it was planted to lettuce. A maximum crop was secured, even more than where lime replaced the phosphate, and even though the plant could not exist on the unphosphated soil supplied only with nutrients. The soil acidity was found to have been greatly increased, but the solubility of the aluminum in dilute acetic and carbonic acids was markedly reduced by the phosphate. The authors found that after sufficient hydrated lime had been added to produce a maximum crop of lettuce a lime requirement equivalent to from 4,000 to 5,000 lbs. of calcium oxid per acre existed at the end of the experiment, in spite of the fact that nearly all the lime had entered into reaction with the soil.

It is concluded, therefore, that "determinations of the amount of what may be called active aluminum may prove to be as desirable as acidity determinations, and the lime requirements of a soil may be due to the need for lime to precipitate toxic aluminum quite as much as to neutralize soil acidity."

It is stated that the details of the experimental work upon which these observations are based are to be published elsewhere.

Vegetation as an indicator of the fertility of sandy pine plain soils in northern Wisconsin, T. J. DUNNEWALD (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 1, pp. 19-23, fig. 1).—This paper, a contribution from the Wisconsin State Soil Survey, briefly summarizes results of chemical and mechanical analyses and of moisture studies of typical samples of sands and loamy and fine sands from widely separated points in cut-over areas of sandy pine lands in northern Wisconsin, in an effort to correlate the soils with the second growth of vegetation supported by them.

Mechanical analyses indicated that soils with small or sparse second growth must be classed as coarse or medium sands, and those with a large second growth as fine sand, the proportion of silt and finer sands being much greater in the latter. Chemical analyses showed that both of these soils were low in the principal plant food elements as compared with fertile soils. The greatest difference between them was deemed to be in the phosphorus content, the sandy group having about 14 per cent less phosphorus in the surface 8 in. than the loamy soils. The percentage of nitrogen was also approximately 14 per cent less in the sandy soil. Moisture equivalent determinations indicated that the loamy soils had about a 27 per cent greater moisture-holding capacity than the sandy soils.

"It is concluded that the character and size of the undergrowth of cut-over lands is a safe indicator of the cropping capacity of the soil for agricultural purposes on sandy pine plain lands. The heavier growth indicates a higher content of plant food, the presence of more fine material in the soil, and

especially a greater capacity of the soil to retain moisture and to enable vegetation and future crops to resist periods of drought."

Soil inoculation, P. E. BROWN (*Iowa Sta. Circ. 43* (1918), pp. 2-7).—This presents a brief discussion of the soil and pure culture methods of inoculation for legumes, and briefly notes some experiments conducted at the station in a comparison of the two methods. Increases in yields and protein content followed both methods of treatment, and the conclusion was reached that the choice between the two methods must depend upon the expense and labor involved in their use.

[Progress report on soils work at the Delaware Experiment Station, 1917], T. F. MANNS (*Delaware Sta. Bul. 119* (1918), pp. 24, 25).—Pot experiments with 50 different samples of Delaware soils receiving various applications of lime and commercial acid phosphate, pure acid phosphate, and manure are briefly noted. Observations on *Bacillus radicicola* in a Chester loam soil showed about 4,100 organisms per gram of soil for the untreated check pot, 1,800 for the pot receiving pure acid phosphate, and 4,500 for the pot receiving commercial acid phosphate, the presence of the sulphur in the acid phosphate being regarded as a possible factor in stimulating the growth of the organism. An increase in the number of actinomyces was noted where manure and lime had been applied.

The best results with muck soils have been obtained from applications of from 1,000 to 2,000 lbs. of wood ashes per acre.

Woburn pot-culture experiments, 1916, J. A. VOELCKER (*Woburn Expt. Sta. Rpt. 1916*, pp. 19-32, pls. 4; *Jour. Roy. Agr. Soc. England*, 77 (1916), pp. 251-264, pls. 4).—A finely ground material, said to be radio-active natural ore containing 0.15 per cent of uranium oxid, was applied to wheat in quantities equivalent to 5 cwt., 10 cwt., and 1 ton per acre, respectively. It is concluded from the results obtained that no advantage whatever accrued from the application of the ore.

In a continuation of experimental work with Bottomley's "humogen," previously noted (E. S. R., 36, p. 517), applications of humogen, peat and nitrate of soda, and nitrate of soda alone were made to beans and mustard, the same relative amounts of nitrogen being present in each treatment. The humogen employed was said to be decidedly inferior in quality to that used before. The only treatment to show any benefit was that of nitrate of soda alone, the gain with peat being immaterial, and humogen producing practically no increase. The use of humogen also failed to show any increase of nitrogen formation in the soil.

Applications of "nitrolim" (calcium cyanamid), ordinary and granular, and dicyandiamid were made to soil one month before seeding to wheat, at time of seeding, and as a top-dressing for spring wheat to determine what ill effect, if any, dicyandiamid had upon plant life. The results indicated that ordinary nitrolim did better on the whole than granular nitrolim, and that both were somewhat superior to dicyandiamid, the differences being more apparent in the top-dressings than in the earlier applications. Dicyandiamid used alone showed a slight reduction in yield, indicating that it may be slightly injurious, though not in the way nor to the extent alleged. Its presence in granular nitrolim was not deemed especially harmful to wheat.

Finely ground feldspar containing 8.5 per cent of potash was used with negative results on red clover at the rate of 10 cwt. per acre, with lime 5 cwt., sodium chlorid 2 cwt., and basic slag 5 cwt.

Acid soils from continuous wheat and barley plats receiving annual applications of ammonium sulphate since 1877 (E. S. R., 36, p. 519), were sown to wheat and treated with 1, 2, 3, and 4 tons of caustic lime and with calcium

carbonate in sufficient quantities to supply calcium oxid in the same amounts as did the caustic lime. Caustic lime proved to be markedly superior to calcium carbonate, except in large quantities, in point of germination, growth, and final development of grain and straw. Spurry, which is said to grow abundantly on these soils, was effectually suppressed by applications of more than 1 ton of caustic lime, while calcium carbonate appeared to have practically no effect on the weed. It is noted by way of a progress report that from 2 to 3 tons of caustic lime per acre may be safely used on such soils, while 4 tons would probably be excessive. In the case of carbonate of lime, an equivalent of 4 tons of lime per acre (about 7 tons of calcium carbonate) is not deemed excessive.

In continuing work with magnesium salts on wheat (E. S. R., 36, p. 519), the chlorid and sulphate were applied at rates of 0.1, 0.15, 0.2 and 0.4 per cent of the soil, respectively. It is concluded that magnesium compounds act differently on wheat according to the anion present; that magnesium chlorid may be beneficial in amounts up to 1 ton per acre, but beyond that may injure or totally destroy the crop; that magnesium sulphate may be safely and judiciously used up to 5 tons per acre; and that the increased nitrogen content of grain obtained by the use of magnesium oxid is not produced by magnesium sulphate.

Tests similar to the above were made with different sodium compounds applied to wheat, and included applications at rates of 0.01, 0.03, 0.1, 0.15, and 0.2 per cent of the soil with the hydrate and carbonate, and 0.1, 0.15 and 0.2 per cent with the chlorid and sulphate. The results are held to indicate that "different sodium compounds behave very differently both as regards the effect on germination and the growth of the wheat crop." The hydrate and carbonate, while at first retarding germination, eventually effected an improvement in the crop, including an increase in the nitrogen content of the grain, even at a rate of 2½ tons per acre. Sodium chlorid showed a beneficial influence in amounts not exceeding 1 ton per acre, but was detrimental to both germination and crop production in larger quantities. Sodium sulphate may be used in amounts up to 2½ tons per acre without detriment. Both the hydrate and carbonate produced a "caking" and a darkening of the soil, not observed with the chlorid and sulphate, which it is thought might interfere with the free growth of the plant and proper soil aeration under field conditions.

Farm manure, F. P. WEAVER (*Penn. State Col. Ext. Circ. 67 (1917), pp. 3-16, figs. 4*).—This bulletin deals with the conservation and use of barnyard manure for Pennsylvania farms and is based on experimental work at the Pennsylvania, New Jersey, and Ohio experiment stations.

It is concluded that for Pennsylvania farms nitrogen should be supplied to the soil by growing legumes, and that concentrated feeds should be bought rather than complete commercial fertilizers. All liquid manure should be saved and manure should be hauled to the field as made to prevent leaching and fermentation. It is also recommended that manure be reinforced with a phosphate.

The use of offal manure and dried blood from abattoirs, F. B. GUTHRIE (*Agr. Gaz. N. S. Wales, 28 (1917), No. 12, pp. 857, 858*).—The composition and method and rate of application of these materials are briefly discussed, emphasis being placed especially upon two points: "(1) That neither offal nor dried blood is a complete manure and (2) that good results are not to be expected if the soil is too dry."

The use of sulphate of ammonia as manure (*Bd. Agr. and Fisheries [London], Food Prod. Leaflet 15 (1917), pp. 3; Jour. Bd. Agr. [London], 24 (1917), No. 8, pp. 859, 860*).—The importance of making liberal use of sulphate of ammonia to increase crop production under war conditions is urged, and methods

of using it on different crops in connection with phosphatic fertilizers are described. The British Government has fixed the price of sulphate of ammonia (24.5 per cent) at £16 7s. 6d. (\$79.70) per ton in bags until May 31, 1918.

Blast furnace flue dust as a potash manure (*Jour. Bd. Agr. [London]*, 24 (1917), No. 8, pp. 852-854).—The potash content, price, and methods of obtaining and applying the flue dust as a fertilizer in England are briefly discussed. It is stated that four grades of the dust, varying in potash content from 2.75 to 13 per cent and in price from 37s. 6d. (\$9.19) to 100s. 6d. (\$24.62) per ton in bags, are now on the market. It is recommended that the dust be used especially on potatoes and applied sometime before planting.

The production of available phosphorus from rock phosphate by composting with sulphur and manure, P. E. BROWN and H. W. WARNER (*Soil Sci.*, 4 (1917), No. 4, pp. 269-282, figs. 3).—Experiments conducted at the Iowa Experiment Station on the production of acid phosphate on the farm by composting rock phosphate with sulphur and various farm manures are reported. Compost, cow manure, and horse manure were used. The compost consisted of a mixture of horse manure, cow manure, straw, hay, and other litter. The rock phosphate used contained 12.81 per cent total phosphorus. Precipitated sulphur was used.

It was found that "all of the manures and the loam tested contained efficient sulfofying organisms. The variations in the efficiency of the organisms in the manures and in the soil were too slight to be distinctive. A depression in phosphorus availability following the fermenting of the untreated horse manure and cow manure, but in the compost a slight increase occurred.

"The addition of sulphur to the manures resulted in greater solubility of the phosphorus than was found in the untreated manures. Composting floats with manure not only resulted in no increased availability of the phosphorus, but in every case caused a noticeable depression which was not overcome at the end of 15 weeks' fermentation. Composting floats with manure and sulphur caused a remarkable increase in the production of available phosphorus which became greater with longer continued fermentation up to 15 weeks. This increase was greater where the sulphur and floats were intimately mixed with the manure than where they were added to the manure in layers. Experiments are necessary to ascertain the best amount of phosphate to mix with sulphur and manure to secure the highest percentage of availability."

Effect of sulphur and manure on the availability of rock phosphate in soil, P. E. BROWN and A. R. GWINN (*Iowa Sta. Research Bul.* 43 (1917), pp. 369-389, figs. 4).—Pot experiments conducted in a greenhouse are described which were planned to determine the effect of sulphur and of farm manure on the availability of raw rock phosphate when the last two materials were applied in amounts usually employed in ordinary farm practice and the sulphur in the proper proportion to react with all the rock phosphate used. Carrington loam and Miami loam soils were employed and the soluble phosphate production, the formation of sulphates, and the sulfofying powers of the soils studied. The pots received single applications at the rate of 12 tons of horse manure, 2,000 lbs. of rock phosphate, and 500 lbs. of sulphur per acre together with combinations of manure and rock phosphate, manure and sulphur, rock phosphate and sulphur; and rock phosphate, manure, and sulphur at the rates indicated. The pots were kept bare and an optimum moisture content maintained. Samples of soil were taken at the end of 3, 6, 9, 12, 15, and 20 weeks and the soluble phosphorus and sulphates determined. The sulfofying power of the soil was determined at the end of 6, 12, and 16 weeks for the Carrington loam and at the end of 16, 20, and 24 weeks for the Miami loam. The results

of the determinations are presented in tabular form, illustrated graphically, and fully discussed.

The conclusions reached may be summarized as follows: The addition of sulphur and manure to the soil increased the availability of the raw rock phosphate more so with the sulphur than with the manure. The greatest gain was obtained where both were used with the rock phosphate, the time of maximum availability varying with the soil. The production of sulphates paralleled in a general way the production of soluble phosphorus. The physical and chemical properties of the soils materially influenced the production of available phosphorus and sulphur. The various treatments and the soil type markedly affected the sulfofying power of the soil, phosphorus and manure increasing sulfofication. A rather definite relationship was also observed between the sulfofying power of the soil and the production of available phosphorus.

In an interpretation of their results the authors state "that under greenhouse conditions the availability of rock phosphate can be increased by applying either manure or sulphur with it. It also seems quite reasonable to assume from the experimental data that the rock phosphate is made available with sufficient rapidity to supply the needs of any growing crop. As an average, the increase in available phosphorus where sulphur was applied with the raw rock over that where the raw rock was applied alone was about 80 lbs. per acre, where 2,000 lbs. of rock phosphate were applied. . . . The increase in available phosphorus due to the action of the manure was not as great as that due to the action of sulphur. Sulphur oxidation, then, is more effective in producing available phosphorus than is the action of decaying organic matter. . . . From the data at hand it appears that the use of sulphur in conjunction with raw rock phosphate, as well as applying manure with it, would be a profitable practice."

Effects of lime and carbonate of lime on acid phosphate, G. S. FRAPS (*Texas Sta. Bul. 223 (1917), pp. 5-16*).—This reports the results of analytical determinations and pot experiments to ascertain the effect of carbonate of lime and of hydrated lime on the availability of the phosphoric acid of acid phosphate in which these materials are used as fillers. The data are tabulated and briefly discussed.

The addition of from 0.5 to 10 gm. of precipitated calcium carbonate to 50 gm. of acid phosphate resulted in a fairly rapid decrease in water-soluble phosphoric acid and a less marked decrease in the citrate-soluble phosphoric acid. Similar applications of hydrated lime showed a more rapid and a greater decrease of available phosphoric acid. These results are held to indicate that the addition of 10 per cent of calcium carbonate would suffice to change 14.2 per cent water-soluble phosphoric acid to the reverted condition, or 7.1 per cent to the insoluble condition, provided the reaction was complete. Observations indicated that this was not the case, however, even after 20 days' treatment with the precipitated carbonate, and with the carbonate in a coarsely ground condition a complete reaction was deemed improbable.

The results of the pot experiments are said to have been rather unsatisfactory but indicated a reduction in the availability of the acid phosphate for corn and sorghum due to the addition of lime.

The use of calcium carbonate as a drier in sufficient amounts to combine with the free phosphoric acid present in some acid phosphates is deemed justified, but when reacting with the acid phosphate moisture is liberated. Nitrate of soda used in conjunction with calcium carbonate increased the insoluble phosphoric acid much more than did sulphate of potash.

The author takes exception to the conclusions reached by Burgess (E. S. R., 35, p. 816) relative to the beneficial effects derived from a mixture of limestone and fertilizing materials and concludes that the use of ground limestone in a fertilizer in excess of 3 or 4 per cent is objectionable.

Ground limestone and prosperity on the farm, C. A. MOOERS (*Tennessee Sta. Bul. 119 (1917), pp. 189-200, figs. 4*).—This presents a general discussion on the value of liming, both for the growing crop and for soil improvement, based on the results of experiments conducted in various parts of the State for the past 12 years. The need of lime on different types of soil in the State and the home grinding of limestone are also discussed, and brief notes are presented on the time and methods of applying ground limestone and on other forms of lime deemed of value for Tennessee.

Gypsum in 1916, R. W. STONE (*U. S. Geol. Survey, Min. Resources U. S., 1916, pt. 2, pp. IV+255-261, map 1*).—This report deals with production and imports of gypsum for the United States for 1916, production in Canada, and new developments in the gypsum industry, and gives mine and mill data and cost data on the production and marketing of gypsum plaster.

"In 1916, for the first time, the total value of the gypsum products of the United States in a single year exceeded \$7,000,000. Since 1912, inclusive, the annual output has been approximately 2,500,000 tons of raw material, but in 1916 the total production was over 2,750,000 short tons . . . In all but three of the gypsum-producing States there was an increase in production in 1916, which shows that the improvement in the industry was general and not local. As in former years, New York was the largest producer of raw gypsum, Iowa ranked second, and Michigan third. Production was made in 18 States and in Alaska. Sales are credited to Illinois, Minnesota, Washington, and Wisconsin, which are not producers of raw gypsum, because they contain mixing plants and warehouses that prepare plasters for the market. There was an increase in quantity, in average price per ton, and in total value of gypsum sold in 1916 for land plaster."

Fertilizers.—An interpretation of the situation in the United States, J. E. POGUE (*U. S. Nat. Mus. Bul. 102 (1917), pt. 2, pp. 22, pl. 1; Amer. Fert., 47 (1917), No. 10, pp. 25-35, pl. 1; abs. in Nature [London], 100 (1918), No. 2517, pp. 406, 407*).—This article explains the functions, uses, and sources of fertilizers, but deals especially with the means of developing and maintaining an adequate domestic fertilizer industry in the United States.

It is pointed out that phosphates occur in abundance in this country, but "as this material must be treated with sulphuric acid to produce fertilizer, its manufacture is closely allied to the sulphuric acid industry. . . . The dependence of the United States upon Chile for sodium nitrate and the rising prices of organic nitrogen urge the desirability of an enlarged by-product coal industry and suitable building up of an atmospheric nitrogen industry in this country. The dependence of this country upon Germany in respect to potash is emphasized and the various war-developed domestic sources of potash described. The assistance that the domestic potash industry merits at the close of the war is discussed.

"In conclusion, the point is stressed that the best progress in the field of fertilizer will come through a true coordination of its various parts, both among themselves and together in respect to other industries, as the result of enlightened cooperation between the fertilizer industry, the Government, and the people."

Fertilizer supplies (*Chem. Trade Jour., 61 (1917), No. 1596, p. 528*).—Orders of the Food Production Department of the Board of Agriculture of Great Britain, with regard to control, distribution, prices, etc., of sulphate of am-

monia, basic slag, superphosphate, compound fertilizers, and blast-furnace flue dust, are briefly discussed, as well as the available supplies of these materials. A fairly good supply of all the materials except that furnishing potash (blast-furnace flue dust) is indicated.

"Potash was by far the most scarce of all fertilizers. To overcome the shortage, the Government had arranged for the erection of a potash factory. Meanwhile, the agricultural demand would be met, in a measure, by a supply of potash through the medium of dust taken from the flues of blast furnaces, which would be supplied through approved agents for direct application to the land at moderate prices."

Commercial fertilizers, 1917, C. D. Woods (*Maine Sta. Off. Insp. 85 (1917), pp. 121-148*).—This reports the actual and guaranteed analyses of 503 official samples of commercial fertilizers and fertilizer material and of 12 samples of lime and limestone collected during 1917. Two unguaranteed brands of land plaster were sampled and found to contain 22.4 and 26.9 per cent of calcium oxid, respectively. Analysis of a sample of "musslizer," said to be dried mussel-bed mud, showed that it contained 0.63 per cent total nitrogen, 0.29 per cent total phosphoric acid, and 0.54 per cent potash.

Fertilizer analyses, A. J. PATTEN, E. F. BERGER, T. E. FRIEDEMANN, and P. O'MEARA (*Michigan Sta. Bul. 280 (1917), pp. 3-48*).—This reports the actual and guaranteed analyses of 928 official samples of commercial fertilizers and fertilizing materials, representing 320 brands collected during the spring and fall inspection of 1917. Deficiencies in one or more plant-food constituents were found in 26.3 per cent of all the samples analyzed. Nitrogen was found to be below guaranty in 8.4 per cent of the samples, total phosphoric acid in 0.4 per cent, available phosphoric acid in 5.9 per cent, and potash in 16.3 per cent.

The fertilizer outlook for 1918 is briefly discussed with particular reference to the increased cost of fertilizing materials.

AGRICULTURAL BOTANY.

Chemical and physical changes in apples during the ripening and storage period, W. P. SNYDER (*Trans. Ind. Hort. Soc. 1916, pp. 408-411*).—The apple fruit, considered as a living organism, has first a period of growth during which the dry matter, principally starch, is continually increased. A second, or ripening, period follows, during which starch is changed into sucrose. This in turn is gradually changed into invert sugar, with a gradual decrease of malic acid and of carbohydrates and an accompanying respiration of carbon dioxid. These changes are largely due to the activity of oxidizing enzymes, the oxygen of the air being drawn upon in the process.

The changes progress much more rapidly after picking, at high temperatures, and in the short-season varieties. Soon after picking, apples should be placed in cool storage to retard the processes above mentioned. Respiration continues during the storage period, becoming ultimately less active. Transpiration continues during the life of the apple. The third period is that of disintegration.

Injection experiments on plants, Y. YENDO (*Jour. Col. Sci. Imp. Univ. Tokyo, 38 (1917), Art. 6, pp. 46, pls. 2*).—In experimentation carried out with various plants, the author found that the rates of conduction in vegetable tissues differ greatly for different substances. Lithium nitrate was readily conducted, copper sulphate and eosin less readily, and anilin violet least readily of the substances tested. Injected substances move toward regions of free transpiration. Lithium goes to leaves rather than to inflorescences and other very young parts. It is carried toward the shoot from cotyledons, rhizome, bulb, or root. Lithium injected into the submerged parts of water plants goes

mainly to the aerial parts. Feeble conduction occurs in plants cultivated in the moist chamber. Conduction is much more ready in leafy than in leafless plants (winter condition). Conduction upward is conspicuous, conduction downward is generally less so, conduction transversely is very feeble. Conduction occurs mainly through the xylem elements, also through the phloem, but only to a slight degree through other regions. Speed of conduction is strongly affected by concentration. Certain fungi conduct lithium, algae hardly at all. Vascular bundles can be traced by the injection method as here employed.

Comparative length of growing season of ring-porous and diffuse-porous woods, F. W. HAASIS (*Plant World*, 20 (1917), No. 11, pp. 354-356).—A limited study of forest trees showed that those having ring-porous wood finished their summer growth at an earlier date than did those having diffuse-porous wood, which grew much faster earlier in the season than later. In case of an evergreen conifer, the growing season is prolonged, as in case of the diffuse-porous wood.

Relation of the rate of root growth in seedlings of *Prosopis velutina* to the temperature of the soil, W. A. CANNON (*Plant World*, 20 (1917), No. 10, pp. 320-333, figs. 3).—Giving a brief account of a portion of numerous observations made as part of a series of studies by himself on the physiological-ecological relations of roots (E. S. R., 36, pp. 525, 733; 37, p. 213), the author states that root growth in mesquite seedlings is limited by temperatures of 12 and 42° C. (53.6° and 107.6° F.) The most rapid growth occurred in a root having an initial length of 16 mm., which in 12 hours grew 51 mm., the temperature ranges of soil and of air being, respectively, 32.5 to 34° and 22.5 to 23.5°. Three types of growth rate variation are to be distinguished. The behavior of the root as regards growth rate and as regards variation of whatever kind in growth rate is probably to be associated with the relation of time of observation to the root's stage of development, that is, to the so-called grand period of growth.

Water cultures, F. THOMPSON (*Delaware Sta. Bul.* 119 (1918), pp. 19, 20).—In this work, which was planned as a study of the limit of tolerance of seedlings to acidity (measured electrometrically) when grown in water cultures started in the spring and continued as long as the growth of water cultures in the greenhouse was practicable, the author employed the 3-salt solution used by McCall (E. S. R., 36, p. 212). One series was run with hydrochloric acid, and another at the same time with sodium chlorid. Owing to difficulties encountered in this work, potassium chlorid will be introduced hereafter as a component of the nutrient solutions.

Physiological studies on *Rhizophora*, H. H. M. BOWMAN (*Proc. Nat. Acad. Sci.*, 2 (1916), No. 12, pp. 685-688).—In work carried on by the author on the red mangrove at the Tortugas Laboratory of the Carnegie Institution during several years, emphasizing the transpiration rate of seedlings of *R. mangle* grown in different concentrations of salt water and in various soils, it was shown by specially devised experiments that the rate of transpiration varies directly with the concentration of the medium. The accelerating effect on transpiration of a certain soil is supposed to be due to chemical action.

Recent investigations on evaporation and succession, F. E. CLEMENTS (*Plant World*, 20 (1917), No. 11, pp. 357-361).—The publication by Gates (E. S. R., 37, p. 725) of his findings and related views on evaporation and plant succession has led to the author's examination of the conflicting views in this field, the results of which are published herein.

The steppes of Spain and their vegetation, E. REYES PRÓSPER (*Madrid: Sucesores de Rivadeneyra*, 1915, pp. 305, map 1, figs. 28).—Defining these steppes, comprising a total of 72,000 sq. km. (28,000 sq. miles) in Spain, as extensive areas showing an extraordinary predominance of lime or clay, with

little or no fertile soil as a rule and subject to extremes of temperature and to scarcity and variability of rainfall, the author makes a detailed report on the physical and chemical features, on the influence of soil and climate in relation to morphology, and on some ecological features of these areas. Some attention also is given to plants as related to various modes and phases of utilization.

Types of segregation, CAROLINE PELLEW (*Jour. Genetics*, 6 (1917), No. 4, pp. 317-339, pl. 1).—The results of studies carried on since 1912, relating mainly to the inheritance of certain abnormalities in the development of anthers and to the inheritance of flower color and of variegation in forms grouped under or related to *Campanula carpatica*, are given. The author claims that some of these forms have been introduced into cultivation from their native habitat, the mountains of Transylvania, and that others have doubtless originated under domestication, little being definitely known as to the origin of the various forms. Self-sterility is characteristic of most of the forms, this characteristic necessitating the employment of cross-fertilization.

Vegetative segregation in a hybrid race, R. R. GATES (*Jour. Genetics*, 6 (1917), No. 3, pp. 237-253, pl. 1).—The author describes a case of vegetative segregation, or remarkably wide somatic variability, combined with individual segregation in the F_2 and F_3 of hybrid races derived alike from *Oenothera rubricalyx* \times *O. biennis* and from the reciprocal cross. The segregating character in question is the size of flower or length of petal.

Studies on the hybrids of *Capsicum annuum*.—II, On some variegated races, S. IKENO (*Jour. Genetics*, 6 (1917), No. 3, pp. 201-229, pl. 1, figs. 2).—Studies carried out since 1913 are reported on a variegated race of *C. annuum*, which is said to have appeared first in 1913, supposedly by mutation (see below).

The author states that this race gave rise by self-fertilization to variegated plants exclusively, the offspring showing variation in wide degrees of this character, which is noted in leaves and branches. Variegation is transmitted from both the paternal and the maternal side. No self-colored green plant was produced by crossing variegated with green plants. Three variegated races were found agreeing perfectly as regards hereditary behavior. The transmission of variegation is thought to occur through the cytoplasm (particularly the plastids), and not through the nucleus.

[A note on some variegated races of *Capsicum annuum*], S. IKENO (*Jour. Genetics*, 6 (1917), No. 4, pp. 315, 316).—This contains a modification, with explanation, of the author's use of the term "mutation" in the article above noted.

Studies in the inheritance of doubleness in flowers.—II, Meconopsis, Althæa, and Dianthus, EDITH R. SAUNDERS (*Jour. Genetics*, 6 (1917), No. 3, pp. 165-184).—Results are here detailed of this work, which was undertaken to ascertain whether in *M. cambrica*, *A. rosea*, or *D. caryophyllus* the mode of inheritance of the character of doubleness presents complex phenomena comparable to those shown by previous experimentation to occur in the stock (E. S. R., 35, pp. 730, 731; 36, p. 826).

The author concludes that these plants differ greatly in this respect from *Matthiola*. Whereas in the stock no intermediate forms are known to exist between the single and the fully double forms, in the Welsh poppy, the carnation, and the hollyhock a more or less continuous series can be obtained. Other differences are indicated.

Sexual dimorphism and variation in *Ginkgo biloba*, N. M. GRIER (*Torreya*, 17 (1917), No. 12, p. 225).—It is stated that personal observation of a few trees by the author tends to confirm the claim of nurserymen that the sex of

G. viloba can be detected by the habit assumed. The male tree, while retaining the conical type of stem, shows a tendency to approach the columnar form, while the conical outline of the female tree shows a much broader base. In the female trees the proportion of bilobed or divided leaves is said to be much less than in the male trees.

Recent studies on variation in Micromycetes, ELISA MUTTO and G. POLLACCI (*Atti R. Ist. Bot., Univ. Pavia, 2. ser., 17 [1917], pp. 53-57, pl. 1*).—The details here given of the forms previously discussed by the authors (E. S. R., 35, p. 547) show how considerable may be the influence exerted upon an organism as regards its characters by the medium in which it is cultivated.

Studies in the nomenclature and classification of the bacteria, II-V, R. E. BUCHANAN (*Jour. Bact., 2 (1917), Nos. 2, pp. 155-164; 4, pp. 347-350; 6, pp. 603-617; 3 (1918), No. 1, pp. 27-61*).—In continuation of the paper previously noted (E. S. R., 37, p. 220), the second paper deals with the primary subdivisions of the Schizomycetes, the third with the families of the Eubacteriales, the fourth with subgroups and genera of the Coccaeæ, and the fifth with the subgroups and genera of the Bacteriaceæ.

FIELD CROPS.

Report of [field crops] work at Kodiak Live Stock and Breeding Station, C. C. GEORGESON and M. D. SNODGRASS (*Alaska Stas. Rpt. 1916, pp. 11, 12, 53-55, 62-64, pls. 2*).—This reports work with field crops conducted during 1916 in continuation of that previously noted (E. S. R., 36, p. 435).

The season is described as the coldest and most backward experienced since the station was established. All cultivated crops made slow growth, but silage crops and pasture grasses remained green and succulent until late in the season.

The natural restoration of grasses on the ash-covered portions of Kodiak and adjacent islands is said to be progressing rather rapidly. The common fireweed (*Epilobium angustifolium*) and scouring rush (*Equisetum pratense* and *E. hyemale*) are most active in revegetating these areas. The seeding of tame grasses is giving satisfactory results. Brome grass, redtop, and timothy made the best showing of the grasses sown in 1915, while creeping bent grass, meadow fescue, and Kentucky blue grass produced good stands but made little growth. Alfalfa winter-killed, but white clover seeded with all the above grasses proved winter hardy and made a good growth in 1916. Grass plats seeded in 1913 indicated that liberal applications of fertilizers were necessary for successful production on volcanic ash. All red clover winterkilled the first winter, very little of the alsike clover survived the three winters, and only a fair amount of white clover survived.

Work with the gang plow on the bench lands (first, second, and third beaches) is said to indicate a lack of sufficient soil below the ash to insure heavy crop production, there being too much gravel and not enough silt and clay to make a good mixture with the ash.

Tests with forage plants begun in 1914 were continued with field peas, cow kale, clovers, alfalfa, tame grasses, root crops, and small grains from seed produced at Fairbanks Station. The grains included oats, wheat, barley, spring rye, and buckwheat. Barley alone reached maturity, while the buckwheat and rye were a total failure. The general oat crop seeded for hay from seed obtained in the open market was inferior both in yield and in size of head to Finnish Black and Norwegian Black oats from Alaska-grown seed. Cow kale was nearly a complete failure, turnips and rutabagas gave very poor yields, and sugar beets tried for the first time produced very poor results. Field peas seeded with oats made a fair growth.

Two species of native grasses (*Elymus mollis* and *Calamagrostis langsдорffii*) deemed of special value for silage and hay are briefly described. *E. mollis*, known as beach rye or beach grass, and found only in the vicinity of salt water beaches, is said to equal green oats for silage but is too succulent for hay. *C. langsдорffii*, or native bluetop, is regarded as an excellent hay crop if cut just as it is heading out, and it is also used for silage.

Report of [field crops] work at Fairbanks Station, J. W. NEAL (*Alaska Stas. Rpt. 1916*, pp. 37-48, 51-53, pls. 3).—This reports the continuation of work with field crops during 1916 along the same general lines as that previously noted (E. S. R., 36, p. 435).

The season of 1916 is described as unfavorable, due to a wet late spring, a dry period in June, and a wet fall. The frost-free period extended over an interval of 98 days, with spring seeding 11 days later than in 1915.

In variety tests with cereals 5 varieties of winter rye, 1 of winter wheat, 4 of spring wheat, 1 of buckwheat, 1 of spring rye, 6 of oats, and 3 of barley attained maturity. Brief notes on the time of seeding, length of the growing period, lodging, and general condition of the crop at time of harvest are presented for each variety.

Orenburg, Hansen Semipalatinsk, Hardy Grimm, North Swedish. Hansen Chernoo, and Hansen Cossack alfalfas seeded in 1915 all survived the winter and made a very fair crop in 1916. Small plants of red and white clover seeded late in May were in bloom by the middle of July.

A mixture of oats and barley seeded for hay on soils that remained wet too late for a seed crop produced at the rate of a little more than 1 ton of cured hay per acre.

An estimated yield of 1,200 lbs. of clean turnip seed was obtained from a planting of 218 bu. of selected roots. Considerable labor is said to be involved in growing a turnip seed crop in Alaska, owing to the fact that the stems are still quite green long after the pods ripen. A plat of 1.5 acres sown to turnips from station seed of the 1915 crop produced 500 bu. of roots.

Variety and fertilizer tests with potatoes were begun, but owing to the appearance and rapid spread of a blight the work was abandoned. The prevalence of both scab and rust on the tubers, even after treatment with formaldehyde, has been noted before, but soaking the seed for 2 hours in a 1:30 solution seemed to practically check scab in 1916.

Methods for maintaining soil fertility under conditions prevailing at the station are briefly discussed. Crop rotation is deemed adequate if sufficient cleared acreage is available, but otherwise the use of commercial fertilizers, green manures, and fallow are recommended.

Distribution of small amounts of turnip seed and of several varieties of grain among farmers for cooperative seed-demonstration tests was made in an effort to encourage the production of early maturing and hardy strains of field crops.

Report of [field crops] work at Rampart Station, C. C. GEORGESON and G. W. GASSER (*Alaska Stas. Rpt. 1916*, pp. 17-22, 23-35, pls. 3, fig. 1).—Work with field crops similar to that previously noted (E. S. R., 36, p. 436) was continued during 1916.

Based on meteorological data for the past 10 years, the winter of 1915-16 was regarded as normal. The frost-free period for 1916 was 89 days, 8 days less than the 10-year average.

The clearing and preparation of additional land for cropping is noted. Observations made on cultivated, sod, and uncleared land to ascertain whether or not the soil froze as deep as it thawed the previous summer were held to indicate that the winter freeze penetrated as deep as the seasonal thaw, even under the most favorable conditions.

The work with alfalfa includes the increase by seed production of valuable sorts, the selection of promising individuals, and the production of new strains by hybridization. *Medicago falcata* continues to give the best results of the varieties tested, but improvement is deemed necessary to overcome its partly procumbent habit of growth and its seed-shattering propensities. Observations were made of individual plants spaced 2 by 3 ft. in the field, and seed from selected plants was collected for further testing. A half-acre tract of Grimm alfalfa seeded two years ago continued to make a vigorous growth. Individual plant selections have been made on this plat, and the seed have been planted separately, one selection possessing the erect habit of growth and the spiral pods of the Grimm type and giving evidence of possessing the hardness of *M. falcata*. Disco and the so-called Hardy Grimm appeared to be about as hardy as regular Grimm. Semipalatinsk alfalfa ripened some seed, but was apparently winterkilled. Seed from a quite erect plant was kept separate. Chernob, Mongolian, and sand lucern seeded in small plats in 1914 had practically all died out by the spring of 1916. In reciprocal crosses between *M. falcata* and Grimm, only about 2 per cent of the blossoms treated produced seed. The author advocates seeding the two varieties in adjacent plats located as far as possible from other alfalfa and allowing open cross-pollination by insects.

Variety testing and hybridization work has been continued with spring and winter wheat, barley, oats, and rye. The F_2 and F_3 generations of wheat crosses made two years ago, using Chogot as the staminate parent and Irkutsk, Marquis, Romanow, and H. G. as pistillate parents, are described as disappointing. Irkutsk was the best spring rye variety tested, but the crop as a whole is deemed the least suited to local conditions of all the grains grown at the station. Seedings of winter rye made on lowland in July, 1915, are said to have done remarkably well, with very little winterkilling, although about 20 per cent of the crop lodged. Thirteen varieties of spring wheat were tested, of which Chogot seeded on a 0.41-acre plat yielded at the rate of 17 bu. per acre and matured in 90 days. The grain is hard and is said to be of good milling quality. Single-head selections of Chogot have been made in an effort to obtain a strain that does not shatter when ripe. Observations of selections having clasped and open glumes have indicated a correlation existing between closeness and ripeness. A study is also being made with both wheat and barley of early and late ripening heads from the same plant, seed from early and late heads being selected and planted in adjacent rows. The earliest heads were almost invariably the smallest. Tests of winter-wheat varieties included plats of Kharkov, Sandomirka, Andrischinskay, and Klondike, the last being completely winterkilled and the other three varieties about 75 per cent resistant. Kharkov lodged almost completely and Sandomirka about 25 per cent. In barley variety tests, a two-rowed, bearded sort from Sweden known as Gold was grown for the first time. It attained a height of 35 in. and tillered freely, each tiller producing a head. The straw was strong, scarcely 5 per cent lodging. This variety required a growing period of 100 days. Notes are presented on different varieties and hybrids of oats, which is said to be the principal cereal crop grown. The greater part of the crop is cut for hay. The small central kernel occurring in spikelets of Hansen, Norwegian, and Banner oats was seeded separately and compared with large kernel seed. The small kernel seed from Hansen produced some plants as vigorous as those from the large kernels, also some inferior plants, while with Norwegian and Banner the results were less favorable for the small seed.

The plat of *Vicia cracca* seeded in 1914 continued to make a satisfactory growth. Tests of hairy winter vetch and gore tares received from Sweden are briefly noted.

Comparative tests of single eye and normal seed pieces of potato, each planted in three 210-ft. rows, resulted in yields of 172.33 and 225 lbs., respectively. Burpee Superior grown on a 0.5-acre plat yielded at the rate of 5.6 tons per acre, and Irish Cobbler grown on a $\frac{1}{2}$ -acre plat at the rate of 4 tons per acre. Thirty-two additional varieties were grown on 50-hill plats, but no comparison of yields was made due to an affection of the leaves and stalks of practically all varieties, thought to be due to a combination of sun scald, tipburn, and early blight. Irish Cobbler and Uncle Gideon Quick Lunch seemed to be most susceptible, while Burpee Superior was practically immune. The tubers of affected plants were uninjured.

[Report of field crops work at the Delaware Experiment Station, 1917], A. E. GRANTHAM and T. F. MANNS (*Delaware Sta. Bul. 119 (1918)*, pp. 8-17, 25, 26).—Fertilizer, rotation, and variety tests with wheat, corn, oats, and soy beans are briefly noted and some of the more striking results indicated.

Liming is said to have increased the yield of hay in a rotation of corn, soy beans, wheat, and red clover by nearly 40 per cent. Corn yields have been increased from 6 to 8 bu. per acre over the unlimed soils. Lime has shown little effect on the yields of wheat and corn not grown in rotation. Of the different elements applied singly, phosphorus has shown the most marked effect on wheat, while phosphorus and potassium together have given the greatest net profit per acre. Nitrogen used with phosphorus and potassium has failed to give a profit with either wheat or corn in rotation. Potassium gave the best results of any single element on both corn and soy beans.

Corn grown in rotation with wheat and red clover yielded about 25 bu. per acre more than that grown in rotation with soy beans and timothy. In a rotation of alfalfa, corn, and wheat the corn yields have averaged from 90 to 95 bu. per acre and the wheat yields about 30 bu.

Tests of various forms of lime and phosphorus carriers are said to indicate that carbonate of lime is nearly as efficient as burned lime for sweetening the soil. High magnesia lime has given about as good results as high calcium lime. Acid phosphate, basic slag, sodium phosphate, bone meal, and raw rock phosphate were found to be effective in the order named.

In variety tests with wheat Gypsy, Rudy, Red Wonder, Valley, and Miracle, all bearded types, have produced the highest yields. Leap Prolific, Currell Prolific, Poole, Harvest King, and Early Ripe are deemed best among the smooth varieties.

Johnson County White is considered to be one of the best corn varieties for fertile land, while good yields have been obtained with Leaming and Reid Yellow Dent.

About 40 varieties of oats have been tested. Spring oats have not proved profitable.

The progress is briefly noted of studies on the assimilation and utilization of plant food by different varieties and types of wheat, the relation of lime to the decomposition of crude organic matter in the soil, and the effect of variations in physical characters and chemical composition of the corn kernel on the vigor and yield of the plant.

Observations on sweet potatoes in storage indicated that the loss of moisture under the usual storage conditions amounted to from 10 to 20 per cent, with about an 18 per cent loss near the stoves and about a 14 per cent loss in the alleys. The loss in bins was from 10 to 12 per cent. Field work in 1917 is said to have further confirmed the fact that liming increases the pox disease of sweet potatoes.

Variety testing and crop improvement (*Nevada Sta. Rpt. 1917, pp. 39-43*).—This reports the results of variety tests with wheat, oats, barley, corn, field peas and beans, millet, potatoes, and field beets.

Of the cereal crops tested in 100-ft. rows the highest yielding varieties for the two years 1915 and 1916 were Galgalos Fife wheat (C. I. 2398), with approximately 66.4 bu. per acre; Early Mountain No. 2 oats (C. I. 656), with 81.7 bu.; and New Zealand barley, with 80 bu. Of the varieties grown in plat tests White Club wheat, Great Dakota oats, and Chevalier barley were first, with respective yields of 55.5, 35.2, and 59.5 bu. per acre. Little Club wheat with 48.9 bu. and Coast barley with 39.6 bu. were highest in cooperative tests made during 1915 and 1916. Improved Leaming corn grown for silage has produced at the rate of 22,570 lbs. per acre for a 4-year period and Sweepstakes at the rate of 21,955 lbs. for a 2-year period.

A number of forage crops have been tested for seed production with maximum yields for a 2-year period of 1,667 lbs. of seed per acre for Kaiser field peas, 1,521 lbs. for Amorita field peas, and 1,506 lbs. for Sudan grass. Of the forage crops tested for hay production Sudan grass gave the highest average yield for a 2-year period, 5,121 lbs. per acre. Green Canada field peas, with an average yield of 4,188 lbs. of forage per acre, was first among the field-pea varieties tested. Siberian and Hog millets were highest, with average yields of 5,430 and 5,210 lbs. of forage per acre, respectively. The highest yielding potato varieties were Great Divide and Burbank, with 4-year average yields of approximately 202.6 and 170 bu. per acre. Our Ideal mangels were first of the root-crop varieties tested, with 31,460 lbs. per acre for a 3-year period.

Progress report, Substation No. 9, Pecos, Tex., 1910-1914, J. W. JACKSON (*Texas Sta. Bul. 221 (1917), pp. 3-21, figs. 4*).—This reports the results of variety and field tests with cotton, cereals, grain and forage sorghums, broom corn, cowpeas, alfalfa, Sudan grass, sorgo-legume mixtures for hay, tobacco, peanuts, beans, and miscellaneous plant introductions on the Pecos substation in western Texas, all crops being grown under pump irrigation. Available meteorological data show wide variations in temperature and rainfall. The date of the last killing frost in the spring is said to vary from February to April, and that of the first killing frost in the fall from October to December, with a mean annual temperature of 64.4°. The annual precipitation varied from 5 to 20 in. over an 8-year period. The experimental work reported was conducted during the period of 1912-1914, inclusive, when the rainfall was above the average.

Four varieties of cotton have been tested during each of the 3 years with the following average yields of seed cotton per acre: Long Staple 1,144 lbs., Mebane Triumph 884.6 lbs., Allen Long Staple 775 lbs., and Yuma 472.6 lbs. By way of a preliminary observation it is suggested that cotton be irrigated very slowly in rather deep, narrow furrows.

Variety tests with small grains have, as a rule, been unsatisfactory due to attacks by rabbits and damage by wind. The 1914 results are said to have been more promising, 19 wheat varieties yielding at the rate of from 9 to 27 bu. per acre and 3 barley varieties at the rate of from 27.5 to 38.75 bu.

Alfalfa production has proved to be rather unsuccessful due to the heavy water requirement of the crop. Peruvian and home grown American are said to be the most promising types.

Fair yields of corn of inferior quality have been obtained but the crop is regarded as second to the grain sorghums except in protected places. Peanuts have proved to be rather unsatisfactory, the Spanish giving the best results in variety tests.

Rep Ripper and Unknown (T. S. No. 56) cowpeas produced average yields of clean seed of 454 and 425 lbs. per acre, respectively, while in tests for forage production in 1912 the highest yields were obtained from Unknown with 2,500 lbs. per acre, Iron with 2,330 lbs., New Era with 2,160 lbs., and Whippoorwill with 2,140 lbs.

The grain sorghums are deemed the most satisfactory grain crop for this region. In variety tests Dwarf Milo and Early Blackhul Kafir have given 3-year average yields of 35.23 and 25.87 bu. per acre, respectively. Spacing tests with grain sorghums sown in 36-in. rows in 1914 gave maximum yields of 20.35 bu. per acre for Kafir corn sown with 14 in. between plants in the row and 28.76 bu. for milo maize sown with 16 in. between plants. The sweet sorghums proved to be valuable hay and silage crops. Sumac, Minnesota Amber, and Red Amber produced average yields for 1912 and 1914 of 15,608, 12,250, and 9,745 lbs. per acre, respectively. Standard, Dwarf Standard, and Dwarf broom corns yielded 1,015, 885, and 790 lbs. of cured brush per acre for the same period.

Date-of-seeding tests with Sudan grass are held to indicate that the time of seeding is not very important. A comparison of 15-, 20-, 30-, and 40-lb. rates of seeding for drilling Sudan grass in 1913 gave yields of cured hay of 2,500, 3,770, 4,890, and 5,160 lbs. per acre, respectively. Seeded in rows at the rate of from 5 to 10 lbs., Sudan grass produced from 209 to 745 lbs. of seed per acre.

In a test of sweet sorghum and cowpea mixtures for hay in 1914 the highest yield of cured hay, 2.74 tons per acre, was obtained from a combination of Sumac sorghum and Groit cowpeas. This practice is not deemed profitable.

[Report of the department of agronomy of the West Virginia Experiment Station, 1915-16], I. S. Cook (*West Virginia Sta. Rpts. 1915-16, pp. 13-15, 16, 17*).—Of 34 varieties and strains of soy beans tested during the past year 4 station selections have been among the first 6 in the yield of beans. Early varieties of oats have proved superior to late varieties and spring to winter varieties. Culberson winter oats and selections from them are deemed best for the northern part of the State, with Winter Turf second. Tennessee Winter barley and one or two other strains are considered quite promising and compare favorably with the spring varieties. In tests with three pure strains of wheat sown singly and in mixtures, the best strain was 22 per cent better than the check, 13.6 per cent better than the poorest strain, and 7.2 per cent better than the second best. A mixture of the three strains exceeded the best single strain by 8.6 per cent, while mixtures of the best and second best, the poorest and second best, and the poorest and best strains dropped 7.8, 14.3, and 10.6 per cent, respectively, below the best.

Preliminary observations on a comparative test of hill and row methods for determining the relative yields of selected strains of corn may be summarized as follows: Depth of color in young plants was thought to bear a negative correlation to germinative vigor and a positive correlation to vigor of later growth. In certain cases pollen was shed during the whole period in which the silk of the plant was receptive, while in other cases all the pollen was shed before the silks appeared. By guarding against the overtopping of some strains by more vigorous adjacent ones frequent replications of small plats gave more nearly accurate results than the same area in larger plats and fewer replications. When two or more strains differing from each other in vigor were grown in the same hill the normal difference was exaggerated, due to overtopping by the more vigorous strain, this being deemed of importance in determining actual differences not otherwise accurately measured. In 249 full hills, each with four stalks from the same parent ear spaced in a square

with 5 in. between stalks, the location of the stalk in the hill apparently affected the yield. With the 249 hills arranged in 10-hill groups and the average yield of the south by west corner considered as 100 per cent, the yield of the west by north corner was 91.2 ± 2.5 per cent, that of the north by east corner 91.4 ± 2.81 per cent, and that of the east by south corner 93.2 ± 2.11 per cent.

Grimm, Baltic, and other hardy strains of alfalfa have not proved superior to common alfalfa from northern-grown seed except in respect to seed production. Grimm has given the highest yield of seed.

Tests with buckwheat showed an increase in yield of 9.24 bu. in favor of early seed bed preparation. A seeding rate of 4 pk. per acre produced 2.3 bu. more than 3 pk. and practically the same as 5 and 6 pk. The average acre yield of Japanese buckwheat was 41.05 bu., of Silver Hull 35.9 bu., and of a mixture of the two of equal parts by weight 42.95 bu. There was practically no difference in yield between drilled and broadcasted seed. The heavy crop of buckwheat produced is said to have been a failure as a nurse crop for red and crimson clovers, vetch, and alfalfa.

[Work with field crops on the Scottsbluff reclamation project experiment farm in 1916], F. KNORR (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1916, pp. 1-11, 12-18, fig. 1*).—This reports the continuation of work previously noted (*E. S. R., 36, p. 132*) with data on weather and crop conditions for 1916.

In trials with leguminous and nonleguminous pasture crops grown alone the most promising grasses were wheat grass, smooth brome grass, and meadow fescue with average yields of dry forage of 3,246, 2,921, and 2,856 lbs. per acre, respectively. Alfalfa with a yield of 8,440 lbs. and alsike clover with 6,298 lbs. were first among the legumes tested. Trials of mixtures of various grasses and legumes are reported in which the maximum yield, 5,973 lbs. of dry forage per acre, was obtained from a mixture of blue grass and white and alsike clovers. The total average yield of the same crops grown separately amounted to 5,356 lbs. per acre.

The results obtained from growing crops in rotation under irrigation are said to show that in every instance the highest yields of potatoes and corn were secured after alfalfa, potatoes showing an increase of 118 bu. per acre. Potatoes showed an increase in yield of 46.8 bu. and beets one of 4.24 tons per acre with manure. Beets following oats or potatoes which followed alfalfa showed an increase of 5.69 tons per acre in favor of alfalfa land. Alfalfa seeded in grain stubble in the fall has produced a 4-year average yield of 4.32 tons per acre the following spring as compared with 1.46 tons from that seeded in the spring.

Variety tests with grain included spring wheat, oats, and barley. Ghirka and Lambahara, with 6-year average yields of 33.3 and 32.9 bu. per acre, respectively, were highest among the bread wheats, while Arnautka, with 33.7 bu., and Beloturka, with 32.8 bu., were first among the durum varieties. Canadian and Kherson, with respective yields of 78.2 and 70.1 bu. per acre, were the highest yielding oat varieties for a 3-year period. Moravian was first among the 2-rowed types of barley, with a yield of 76.9 bu. for a 5-year period, and Han River, with 74.1 bu., for the 6-rowed type. Four 2-rowed varieties produced an average of 68.2 bu. as compared with 57.2 bu. from 8 6-rowed varieties.

Date-of-seeding tests with barley resulted in yields ranging from 47.6 to 32.9 bu. per acre for seedings made from March 20 to May 12. Similar tests with corn resulted in average yields ranging from 37.9 to 45.3 bu. for plantings made from April 20 to May 21.

Potatoes grown from various kinds of seed stock produced 3-year average yields ranging from 134 bu. for field-run seed to 247.2 bu. for immature seed of Pearl and from 207.4 bu. for field-selected seed to 314.4 bu. for immature seed of Eureka.

Cultural tests with alfalfa resulted in yields of 6.46 tons per acre with a 10-ton application of manure in early spring, 4.49 tons with spring-tooth harrowing, 3.96 tons with disking, and 5 tons with the untreated check. Tests of various strains of alfalfa resulted in yields ranging from 3.49 tons per acre for a native strain grown in eastern Wyoming to 4.76 tons for Baltic.

Dry farm crop rotations and cultural methods, A. ATKINSON, J. M. STEPHENS, and G. W. MORGAN (*Montana Sta. Bul. 116 (1917), pp. 54, figs. 6*).—Considerable tabulated data are presented and fully discussed by way of a preliminary report of experimental work on continuous cropping, crop-rotation systems, and cultural methods for field crops under dry-land conditions in progress on the Judith Basin substation since 1908 and on the Huntley experiment station farm since 1912 in cooperation with the U. S. Department of Agriculture. The average annual precipitation at Judith Basin for the period of 1898–1915 was 16.66 in., 10.9 in. of which fell between April 1 and September 30. The average annual precipitation at Huntley for the past 9 years has been 13.74 in., 8.42 in. falling from April to September, inclusive. The average mean temperatures for the months of April to September, inclusive, have been 54.8° at Judith Basin and 59.7° at Huntley. The average wind velocities for the same period have been 6.3 miles per hour at Judith Basin and 4.1 miles at Huntley.

The crop rotation data, reported from Judith Basin, are from 27 different cropping systems, including 2-, 3-, 4-, 5-, and 6-year rotations of winter and spring wheat, oats, barley, corn, flax, brome grass, alfalfa, and clover; and those from Huntley from 29 cropping systems, including 2-, 3-, 4-, and 6-year rotations of the same crops. Continuous cropping tests were conducted at each station with winter and spring wheat, oats, corn, and flax, and with barley at Judith Basin. These crops received various treatments as follows: Spring plowing to a depth of 4 in., except for winter wheat, which was plowed just before seeding; fall plowing to a depth of 7 or 8 in., alternate summer fallowing and cropping; fall plowing and subsoiling; fall listing; and, at Judith Basin, spring plowing to a depth of 7 or 8 in. for spring wheat, and spring listing for corn. The observations may be summarized as follows:

In two-year rotations of spring grains and corn and spring grains and fallow, and in three-year rotations containing spring grains for two years, and either corn or fallow the third year, those rotations containing corn have been more profitable than those with fallow. In three-year rotations containing two years of small grain and one year of corn it has been found more profitable to disk the corn land than to plow it as a preparation for one of the small-grain crops.

Rye was more profitable than peas as a green-manure crop. Three-year rotations containing a green-manure crop were less profitable than four-year rotations containing a green-manure crop, while both three- and four-year rotations containing green-manure crops have been less profitable than similar rotations where clean fallow replaced the green manure.

Rotations containing sod crops for two or three years have given comparatively low profit, brome grass having been a little more profitable than alfalfa as a sod crop.

Winter wheat cropped continuously showed the greatest profit from fall plowing at Judith Basin, while summer fallowing has shown the least profit. At Huntley the most profitable method was summer fallowing, subsoiling being

the least profitable. With spring wheat listing has been the most profitable and summer fallow the least profitable method of seed-bed preparation at Judith Basin. At Huntley listing was the most profitable.

At Judith Basin listing has been the most profitable and summer fallow the least profitable practice with oats. Listing was most profitable at Huntley.

At Judith Basin corn on spring plowing was most profitable and on summer fallow least profitable. At Huntley corn on spring listing was most profitable and on summer fallow least profitable.

At Judith Basin spring plowing has been most profitable with flax and summer fallow least profitable. At Huntley flax on fall plowing has been most profitable and on subsoiling least profitable.

Irrigation experiment with alfalfa, potatoes, and wheat (*Nevada Sta. Rpt. 1917, pp. 27-39*).—This reports the progress of work previously noted (*E. S. R., 37, pp. 30, 435*), giving results for the season of 1916 which largely confirm those already obtained.

More detailed data are presented than heretofore on variations in soil moisture during irrigation, giving the average percentage for the first 4 ft. of soil for the different applications and at the various wilting stages employed in these investigations. With alfalfa the greatest variation was found in the last wilting stage with the 12-in. application, the soil moisture content at the second cutting being 64.4 per cent less than before the first irrigation. The 6- and 9-in. irrigations given before the plants showed need of water, resulted in actual increases in soil moisture at the second cutting of 9.7 and 37.2 per cent, respectively. In every other case there was a decrease which became greater as the wilting stage advanced. No uniform variations were observed with potatoes except in the case of 3-in. applications, which showed a maximum decrease of 9.7 per cent at harvest time where the plants were irrigated after they failed to revive at night.

Comparisons were made of the soil moisture content before the first irrigation of wheat and before irrigation at the milk stage where one and two irrigations were omitted. With the omission of one irrigation the greatest decreases amounted to 56.3 per cent with 3-in. applications, and to 17.4 per cent with 7-in. applications where the irrigation at the bloom stage was omitted. The smallest decrease of 18 per cent with 3-in. applications was with an irrigation omitted at the milk stage, while an increase of 3.7 per cent occurred with 7-in. applications. The average decrease for all 3-in. applications was 28.9 per cent, and for all 7-in. applications 4.5 per cent. Where two irrigations were omitted the greatest decrease of 60.5 per cent with 3-in. applications, and of 32.9 per cent with 7-in. applications occurred where irrigations were omitted at the boot and bloom stages. The smallest decrease occurred with the omission of irrigations at the 5-leaf and dough and the milk and dough stages, amounting to an average of 12.2 per cent for 3-in. applications, and of 1.8 per cent for 7-in. applications. The average decrease for all 3-in. applications was 28.9 per cent, and for all 7-in. applications 10.6 per cent.

A further comparison was made of the soil moisture content before the first irrigation of wheat and at harvest with the omission of one and two applications and of two consecutive irrigations. The greatest decrease with 3- and 7-in. applications where one irrigation was omitted amounted to 45.4 and 12.2 per cent, respectively, where an irrigation at the dough stage was omitted. The smallest decrease of 9.1 per cent with 3-in. applications occurred with an irrigation omitted at the milk stage, while with the 7-in. applications the greatest increase, 10.3 per cent, occurred with an irrigation omitted at the bloom stage. The average decrease for all 3-in. applications was 23.9 per cent, while for all

7-in. applications there was an average increase of 1.5 per cent. When two irrigations were omitted the greatest decrease with 3-in. applications amounted to 23.9 per cent when irrigations at the 5-leaf and milk stages were omitted. The smallest decrease, 3.1 per cent, occurred when irrigations at the boot and bloom stages were omitted. No uniform variations were observed in the case of 7-in. applications, the greatest decrease at time of harvest being 48 per cent with irrigations omitted at the boot and milk stages, and the greatest increase, 13.2 per cent, with irrigations omitted at the 5-leaf and bloom stages. With the omission of two consecutive irrigations decreases in soil moisture content at harvest time with 3-in. applications omitted at the milk and dough, the bloom and milk, the 5-leaf and boot, and the boot and bloom stages were 19.5, 11.9, 16.8, and 3.1 per cent, respectively, while with the 7-in. applications the respective decreases were 6.1, 9.4, 2.5, and 0 per cent. The average decrease for all 3-in. applications was 13.3 per cent and for all 7-in. applications 0.5 per cent.

Where only two applications were made, one before and one after heading, the greatest decrease in soil moisture occurring before the second irrigation was with 9-in. applications before and after heading and amounted to 23.4 per cent. The smallest decrease was 8.3 per cent with a 9-in. application before and a 6-in. application after heading. The greatest decrease at time of harvest was 34.2 per cent with a 12-in. application before heading and a 6-in. application after heading. The smallest decrease, 10.6 per cent, occurred with 6-in. applications before and after heading.

Date- and rate-of-seeding tests with spring grains under irrigation, A. ATKINSON (*Montana Sta. Bul. 120 (1917), pp. 105-117*).—This bulletin reports the results of experiments with standard varieties of spring wheat, oats, barley, and peas conducted on irrigated land at Bozeman at an altitude of 4,870 ft. to determine the effects of different dates and rates of seeding on the yield of grain and straw, the quality of the grain, the length of the growing period, the height of the crop, and the percentage of lodging. The results are summarized in tabular form and briefly discussed.

In the date-of-seeding tests plantings were made on the first day that a seed bed could be properly prepared each spring for seven years with wheat, oats, and barley, and for six years with peas, and successive plantings made on the same day of the week for each of the seven weeks following. The average date of the first planting for the grain crops was April 15 and the last planting June 4, while with the peas the first and last dates were April 18 and June 5, respectively. The average acre yields of grain obtained from the early plantings (first four planting dates) were 58.12 bu. for wheat, 96.16 bu. for oats, 71.99 bu. for barley, and 41.36 bu. for peas, as compared with 40.19, 80.75, 64.48, and 37.39 bu., respectively, for the late plantings (last four planting dates). No important differences were observed in the amounts of straw produced from crops planted on the different dates, but the average number of pounds of straw per pound of grain secured was deemed significant and amounted to 2.04 for wheat, 1.59 for oats, 1.43 for barley, and 1.48 for peas for the early plantings, as compared with 2.57, 1.8, 1.67, and 1.58 lbs., respectively, for the late plantings. The quality of the grain harvested from plots planted on different dates was determined by the average weight per measured bushel. For the early plantings these weights were 60.62 lbs. for wheat, 41.32 lbs. for oats, 52.94 lbs. for barley, and 62.25 lbs. for peas, as compared with 57.1, 37.94, 51.19, and 62.02 lbs., respectively, for the late plantings. Early planted grain utilized a longer growing period than that planted late in every case, the average number of days from seeding to maturity from the first planting date to the last ranging from 189.17 to 118.83 for wheat, from 135.14 to 111 for oats, from 134.43 to

110.33 for barley, and from 131 to 101.8 for peas. The height of the various crops varied from year to year, but differences between crops planted on different dates were regarded as relatively unimportant. The lodging of the crop is said to depend more on the season than on the date of planting.

The same crops were used in the rate-of-seeding tests and were planted at rates of 2, 4, 6, 8, 10, 12, 14, and 16 pk. per acre each spring for 8 years for wheat, oats, and barley and 7 years for peas. The maximum yields of grain were obtained from the heavier seedings, as follows: Wheat, 60.13 bu. at a 14-pk. rate of seeding, 106.44 bu. for oats at a 12-pk. rate, 76.73 bu. for barley at a 16-pk. rate, and 42.19 bu. for peas at a 16-pk. rate. Slightly higher yields of straw were also secured from the heavier rates of seeding. With wheat, oats, and barley the weight per measured bushel of grain increased slightly as the rate of planting increased, but with peas the highest weight was obtained with the lighter plantings. With the exception of peas, which remained practically constant at 124 days, the average length of the growing period decreased from the lowest rate of seeding to the highest rate, with an average range of from 129.2 to 124.4 days for wheat, from 122.1 to 118.7 days for oats, and from 125.1 to 118.5 days for barley. The length of straw varied but slightly with the cereal crops, while in the case of peas the length of the stem increased from 45 in. for the 2-pk. rate to 51.2 in. for the 14-pk. rate. A definite relation between the rate of seeding and lodging was observed, the percentage increasing from the lowest rate to the higher rates. Wheat varied from 25 per cent at the 2-pk. rate to 34.37 per cent for the 16-pk. rate, oats from 2.85 per cent for the 2-pk. rate to 35.7 per cent for the 16-pk. rate, and barley from 40 per cent for the 2-pk. rate to 66.62 per cent for the 14-pk. rate. Recommendations for seeding grains on these irrigated lands are made as follows: For spring wheat 8-pk., for oats 10 to 12 pk., for barley 8 to 10 pk., and for peas 10 to 12 pk. per acre.

Cooperative grain testing among Matanuska Valley farmers, M. D. SNODGRASS (*Alaska Stat. Rpt. 1916*, pp. 66-69, fig. 1).—Cooperative tests were begun in 1916 by settlers in the Matanuska Valley of a few of the better yielding varieties of grains grown at the Rampart and Fairbanks stations. The tests as a whole were regarded as rather unsuccessful, due principally to unfavorable weather conditions, but the results are thought to demonstrate the advisability of thoroughly testing varieties of grain, vegetables, potatoes, and root crops in order to ascertain the varieties best adapted to local conditions.

Silage crops for Nevada, C. S. KNIGHT (*Nevada Sta. Bul. 91 (1918)*, pp. 16, figs. 9).—The relative value of those silage crops deemed of most importance in Nevada, including corn, Russian sunflower, Sudan grass, wheat, millet, field peas and oats, sweet clover, alfalfa, sorghum, Russian thistle, sugar beets and mangels, and sugar-beet tops is briefly discussed and approved cultural methods outlined.

In variety tests with corn for a 4-year period Improved Leaming, with an average yield of 22,570 lbs. per acre, and Sweepstakes, 21,955 lbs., were first of 11 varieties. The highest average yields of silage from varieties of non-saccharine sorghum tested for 2 years were 21,736 lbs. for Red Kafir, 18,149 lbs. for Dwarf Black Hulled Kafir, and 18,098 lbs. for White Kafir.

Directions for filling the silo and notes on silo construction are included.

Farm practice in the production of hay in Steuben County, N. Y., and Washington County, Pa., H. B. McCURE (*U. S. Dept. Agr. Bul. 641 (1918)*, pp. 16, figs. 3).—Statistical data on the amount of labor required per acre and per ton for each operation and on machinery charges per acre and per ton are presented as obtained in a detailed study of hay production made during 1915

on 52 farms in Steuben County and on 37 farms in Washington County, the methods used by hay growers being practically the same in both sections. The average size of the farms studied in Pennsylvania was 171 acres and in New York 202 acres, with a tillable area per farm in each case of approximately 156 acres. Of the tillable area in New York, 35 per cent was in hay, as compared with 26 per cent of the Pennsylvania area. The study included observations on the cost of seeding, mowing, tedding, raking, loading, hauling, and putting hay into the barn and on machinery charges, together with information procured relative to the amount of seed grown; the work accomplished per hour, per acre, and per ton; and the cost, for each locality, of baling and of hauling to market.

The total cost of production, including labor, machinery charges, interest on hay land, taxes, and seed, was estimated to average \$5 per ton for New York and \$6.10 for Pennsylvania, with average yields of about 1.5 tons per acre, while the average farm value of hay on December 1 for the 10-year period 1906 to 1915 was \$14.62 per ton for New York and \$15.14 for Pennsylvania. The amount of man labor required per ton of hay averaged 4.2 hours for the New York farms and 5.23 hours for the Pennsylvania farms. The amount of horse labor required was 4.22 hours per ton in New York and 5 hours per ton in Pennsylvania. Approximately 36 per cent of the New York hay was sold, while only 17 per cent of that produced in Pennsylvania was sold. The life of hay meadows in New York averaged 3.66 years and in Pennsylvania 4.1 years.

Permanent pastures and meadows, T. S. PARSONS (*Wyoming Sta. Rpt. 1917*, pp. 170-177).—Grass, alfalfa, and clover mixtures for irrigated pastures and meadows in Wyoming, based on field tests covering a 5-year period, are briefly discussed. Of the grasses tested, brome grass was the only one that lived through the entire period, and it proved to be sufficiently drought resistant to make a pasture on the dry farm. Tall oat grass, wheat grass, and timothy were next best in hardiness. Alfalfa mixtures gave the largest average yields, but the alfalfa crowded out the grasses to a great extent after two or three years. Brome grass used in mixtures crowded out all other grasses. Tame grass mixtures did not succeed on alkali soils, sweet clover being deemed best for such soils.

Brief notes are given on soils for grass mixtures, on seed-bed preparation, and on the irrigation of pastures and meadows.

Barley, an early maturing crop for years of feed shortage, L. C. BURNETT (*Iowa Sta. Circ. 48 (1918)*, pp. 4, fig. 1).—Brief directions are given for growing the crop in Iowa, and varieties deemed suited to Iowa conditions are noted.

Cotton seed for planting purposes, W. E. AYRES (*Arkansas Sta. Circ. 37 (1918)*, pp. 4, fig. 1).—The necessity of employing only viable seed of reliable varieties of cotton is emphasized. Data are presented showing the results of germination tests with three classes of seed in the same variety, namely, matured cotton harvested early in October, 1917, with an average germination of 90 per cent, matured cotton harvested January 27, 1918, with 43 per cent, and frosted cotton harvested the same date with 14 per cent.

Lint percentage and lint index of cotton and methods of determination, G. S. MELOY (*U. S. Dept. Agr. Bul. 644 (1918)*, pp. 12, fig. 2).—Simple methods for determining lint index (*E. S. R.*, 20, p. 439), lint percentage, and weight of seeds in samples of seed cotton are outlined.

The lint index is described as the weight in grams of the fiber produced by 100 seeds and is deemed to be a measure of the abundance of the fiber rather than of the relation between the weight of fiber and weight of seed, as is the

lint percentage. The lint index may be determined by means of the formula

$$\text{Weight of 100 seeds} \times \text{percentage of lint}$$

$$\text{Percentage of seed,}$$

provided a sensitive balance is available. A table is presented to facilitate the finding of lint indexes of samples of seed cotton in which the weight of 100 ginned seeds lies within the limits of 6 to 16 gm. and the percentage of lint within 25 to 42. The data thus obtained are held to indicate that a larger percentage of lint may be due entirely to a decrease in the weight of the seed without a change in the amount of fiber per seed. Furthermore, the lint percentage may steadily increase as the size of the seed decreases without altering materially the actual amount of fiber obtained and, conversely, an increase in seed weight may reduce the lint percentage without an actual reduction in the amount of lint, but unless the reduction in percentage of lint is proportionate with the increase in size of seed the abundance of lint is also increased notwithstanding the reduction of the lint percentage.

The numbers of seeds and bolls per pound of fiber are computed in tabular form for different lint indexes. The data show that an increase in weight of seed of from 8.5 to 11.3 gm. per hundred, with a constant lint percentage of 33, results in an increase of $33\frac{1}{2}$ per cent of fiber and leads to a reduction of the number of seeds required to produce 1 lb. of fiber of from 10,785 to 8,089, or an average of 64 bolls, representing a saving of 25 per cent in the number of bolls to be picked. Five-locked bolls numbering 88,500 will yield one bale of cotton in all varieties having a lint index of 6, while 133,500 bolls will be required for all varieties with a lint index of 4. An increase in lint percentage does not alter the cost of production if the lint index remains constant.

An improved balance for the direct reading of lint percentages by the use of a standard sample of seed cotton weighing 100 gm. is described and other advantages of using such a standard sample indicated. In the absence of a sufficiently sensitive balance the number of seeds in a standard sample may be taken as an indication of their size, and the numbers of seeds in such samples calculated for various percentages of lint and weights of seed per hundred are tabulated.

The cotton grower may determine with fair accuracy the size of the seed and the lint index of the variety he plants by counting the number of seeds in 3.5 oz. of seed cotton (about 100 gm.) and referring to the tables in this bulletin.

Improving the oat crop, L. C. BURNETT (*Iowa Sta. Bul. 175 (1918), pp. 150-172, figs. 10*).—Methods of increasing the yield of oats in Iowa, where the crop is said to occupy 32 per cent of the land sown to cereals, are described. These include the selection of adapted varieties showing consistently high yields from year to year, the use of home-grown seed, drilling in the seed at a sufficiently heavy rate of seeding, the use of manure and fertilizers in the rotation, and the employment of improved cultural methods and field practices in growing the crop such as treating the seed for smut, early seeding, and proper harvesting and handling in the field.

Considerable tabulated data are presented showing the results of variety tests covering a period of several years and indicating the yields, date of maturity, height, percentage of lodging, and per-acre value for a number of varieties. The 10 leading varieties deemed suited to Iowa conditions are briefly described and include with their respective average acre yields for the period of 1907 to 1916, inclusive, Kherson with 51.7 bu., Silvermine with 50.2 bu., Green Russian with 49.9 bu., Irish Victor with 48 bu., Joannette with 47.7 bu., Red Texas with 45.1 bu., White Russian with 44.5 bu., Swedish Select with 43.5 bu., Early Champion with 42.6 bu., and Clydesdale with 40.8 bu.

The use of heavy seed purchased outside the State failed to show any advantage over lightweight home-grown seed of the same variety in tests conducted at Ames for 4 years. Average yields for northern-grown, western-grown, and foreign-grown seed amounted to 38.79, 38.36, and 31.06 bu. per acre, respectively, as compared with corresponding yields from seed grown at Ames of 39.2, 38.68, and 35.35 bu. Observations on the effect of fanning and grading seed oats with particular reference to the accumulative effect of the treatment through successive generations indicated that larger yields were obtained from the fanned seed, but the data for the first seven generations are not deemed sufficiently consistent to attribute the increase to an accumulative effect.

Seed drilled in produced on the average 54.74 bu. per acre for the period of 1907-1916, inclusive, as compared with 49.73 bu. from broadcasting. Tests begun in 1915 to determine the best distance between drill rows are said to indicate that with a seeding rate of about 3 bu. per acre 6- or 8-in. drills give higher yields than 4-in. drills.

In rate-of-seeding tests with 3 representative varieties of oats conducted during a 5-year period maximum yields were obtained as follows: Silvermine, 52 bu. per acre for a rate of 3 bu.; Kherson, 58.1 bu. for a rate of 4.5 bu.; and Iowa No. 105, 70.5 bu. for a rate of 3.5 bu.

Fertilizer tests with oats grown in a 4-year rotation for the period of 1907-1916 showed an average yield of 69.4 bu. per acre for plats receiving 8 tons of manure, 800 lbs. of steamed bonemeal, and 400 lbs. of potassium chlorid during the rotation as compared with 57.11 bu. from the untreated checks. Manure alone resulted in a yield of 63.65 bu. per acre.

Improved method of fighting smut in oats, H. D. HUGHES (*Iowa Sta. Circ. 45* (1918), pp. 8, figs. 4).—A comparison of different methods of formaldehyde treatment for the prevention of smut in oats conducted during the period of 1915-1917 is said to show "very definitely that the time and labor heretofore expended for this purpose may be greatly reduced by increasing the strength of the solution and not making the seed wet enough to necessitate drying before seeding."

Solutions were tested which contained 1 pt. of formaldehyde each to 3, 5, 10, 20, 30, and 40 gal. of water, the amount applied per bushel of grain ranging from 1 to 8 pt. Different lots of seed were also treated with the different solutions and covered for from 0 to 14 hours. Germination tests were made with each lot of treated seed and field plats seeded with treated and untreated seed. All treatments proved effective against smut in 1915, there being only 1.83 per cent smutted heads from the untreated seed. In 1916 and 1917 the treated seed showed less than 1 per cent smut while untreated seed produced 12.7 and 11.5 per cent smutted heads, respectively.

The 1:10 solution applied at the rate of 1 qt. per bushel of grain is deemed best, chiefly because the required amount of formaldehyde for a complete control of smut can be applied without wetting the seed enough to necessitate drying. In repeated trials seed sacked immediately after treatment ran through the drill 12 hours later as rapidly as untreated seed. Average yields of seed receiving various treatments and left uncovered amounted to 65.5 bu. per acre as compared with 67.5, 65.8 and 66 bu. for seed covered 4, 8, and 14 hours, respectively.

[Potato variety tests at the Sitka Station], C. C. GEORGESON (*Alaska Stas. Rpt. 1916*, p. 8).—About 50 varieties of potatoes were grown at the station during 1916, as heretofore (E. S. R., 36, p. 437), but owing to the wet season both the yields and quality were inferior to the 1915 crop. Green Mountain, Keeper, and Norway No. 1 matured seed balls during 1915. The seed was sown

in flats in May, 1916, and about 600 plants were set in the field in July. Growth is said to have been quite rapid, some of the plants reaching the blooming stage before they were dug.

Potato culture in Nevada, C. S. KNIGHT (*Nevada Sta. Bul.* 90 (1918), pp. 24, figs. 19).—This is a revised and enlarged edition of Nevada Bulletin 87 (E. S. R., 37, p. 442) containing considerable general information on potato growing deemed of special value at the present time. Information is also presented on the use of potato machinery and the general care of larger crops for the benefit of growers of tracts of 5 acres or more.

Potatoes, R. J. BARNETT, F. D. HEALD, and A. L. MELANDER (*Washington Sta. Pop. Bul.* 113 (1918), p. 1).—A popular publication in the form of a poster outlining some factors deemed essential to successful potato growing, showing common disease and insect pests of the crop and noting methods for their control.

Soy beans in systems of farming in the cotton belt, A. G. SMITH (*U. S. Dept. Agr., Farmers' Bul.* 931 (1918), pp. 23, figs. 11).—This publication presents a description of the field practices and cultural methods employed in growing the crop in the southern States, together with a brief discussion of the importance of the soy bean in the agriculture of the cotton belt.

Grow spring wheat in Iowa, L. C. BURNETT (*Iowa Sta. Circ.* 47 (1918), pp. 4).—Brief directions for growing the crop are given with notes on varieties deemed suited to Iowa conditions.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr.*, 1 (1918), No. 7, pp. 8, figs. 2).—A map showing the 10 divisions into which the country is divided for seed reporting work is presented and considerable tabulated data given showing the stocks on hand and total receipts by divisions of field seeds as obtained by the War Emergency Seed Survey of January 31, 1918. A similar report on stocks of vegetable and field seeds for Canada made by the seed commissioner of Canada is presented. Statistics are also given on the wholesale, jobbing, and retail prices of the highest grade field seeds on or about March 23, 1918, for seven of the seed reporting districts. The commercial sugar beet seed situation as indicated by the War Emergency Seed Survey is briefly noted.

The usual statistics on imports of forage plant seed permitted entry into the United States during March, 1918, are presented and compared with previous receipts.

HORTICULTURE.

[Report on horticultural investigations], W. H. ALDERMAN (*West Virginia Sta. Rpt.* 1915-16, pp. 38-41).—A careful study was made of the morphology of the apple blossom, including a study of pollen viability when grown in various media ranging from distilled water to the stigmatic extract of various varieties of apples and other plants. This work has shown that an 8 per cent dextrose solution formed very good artificial media for germination and that viable pollen would germinate in a stigmatic extract of practically all varieties of apples and even on the stigma of such plants as the geranium and cucumber. Hence it appears that unfavorable germination media on the surface of the stigma is not a limiting factor in the pollination of apples. It is suggested that at least one limiting factor governing self-sterility of apples is due to inability of the pollen tube to penetrate the ovary quickly enough so that fertilization may take place before the disintegration of egg nucleus. The study was continued along this line.

A study of the more practical features of the pollination problem was made in an orchard of Rome apple trees at Grape Island. Foreign pollination by bees and also through hand pollination gave as a result a much more prolific

setting of fruit than on check trees in another part of the orchard. Hence it is concluded that the Rome variety in this orchard at least is self-sterile.

Studies on the physiological effect of pruning apple trees and on the thinning of apples have been reported in bulletin form (E. S. R., 36, p. 535; 37, p. 448, respectively). Fertilizer experiments with peaches and apples, previously reported on (E. S. R., 38, p. 41), have been continued. Lists are given of the most promising varieties to date of strawberries and bush fruits included in the station tests.

[Horticultural investigations in Alaska], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1916*, pp. 6-8, 9, 10, 35-37, 48, 49, 65, 69-81, pls. 3).—A brief report on the work with fruits, vegetables, and ornamentals at the Sitka Station and at the branch stations (E. S. R., 36, p. 442), together with the usual extracts from letters from settlers and others regarding results obtained from the seed and plant distribution and other plantings (E. S. R., 36, p. 494).

Home gardening in the South, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 934 (1918)*, pp. 44, figs. 20).—A treatise on growing a home supply of vegetables, prepared with special reference to conditions in the South. The general principles of gardening are discussed, including the use of hotbeds and cold frames, and specific instructions are given for growing the more important vegetables. Outline maps of the United States are given which are divided into zones with a difference between them of about two weeks in the average date of the last killing frost in spring and the first killing frost in autumn. Tables are also given showing the earliest safe dates and the latest safe dates for planting vegetables in the different zones.

The farm garden in the North, J. H. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 937 (1918)*, pp. 53, figs. 23).—A treatise similar to the above on gardening in the North.

The city and suburban vegetable garden, H. M. CONOLLY (*U. S. Dept. Agr., Farmers' Bul. 936 (1918)*, pp. 52, figs. 41).—A treatise on vegetable gardening, similar to the above, prepared with special reference to city and suburban districts. In addition to cultural directions, suggestions are given for organizing garden clubs, together with labor and expense records based upon the reports from a large number of garden clubs in the District of Columbia. Data are also given showing the approximate value of different crops from city gardens.

The home vegetable garden, J. C. WHITTEN (*Missouri Sta. Circ. 83 (1918)*, pp. 22).—A popular treatise on home gardening, including specific directions for growing the more common vegetables.

Home vegetable gardening from A to Z, with special reference to Pacific coast conditions, A. KRUEH (*Garden City, N. Y.: Doubleday, Page & Co., 1918*, pp. VI+294, figs. 255).—A manual of information on the culture of the more common vegetables. Introductory pages deal with the general principles of gardening. Special reference is made to differences in cultural treatment on the Pacific coast. The text is fully illustrated from photographs of actual garden practice.

Growing plants for war gardens, C. E. DURST (*Illinois Sta. Circ. 216 (1918)*, pp. 16, figs. 17).—This circular contains general directions for starting vegetable seed in flats and growing plants for transplanting purposes, including specific directions for handling the more common vegetables.

The right time to plant vegetables, J. W. LLOYD (*Illinois Sta. Circ. 217 (1918)*, pp. 4).—This circular contains practical suggestions relative to the proper time to plant different classes of vegetables, with special reference to Illinois conditions.

Insects and plant diseases attacking garden crops, J. H. MERRILL and L. E. MELCHERS (*Kansas Sta. Circ. 65 (1918), pp. 12*).—A calendar for the control of insect pests and plant diseases, including formulas for making sprays, solutions for seed treatment, and other mixtures.

Growing late cabbage, E. N. REED (*Bul. N. Y. State Veg. Growers' Assoc., 4 (1918), No. 3, pp. 22-25*).—Practical instructions are given for growing late cabbage, and the "mature head" method of raising cabbage seed as developed by the author and his brother and followed for about 10 years is described.

Reciprocal breeding in tomatoes, B. D. HALSTED (*Jour. Heredity, 9 (1918), No. 4, pp. 169-173*).—For the purpose of studying the relative values of the two directions of the cross in reciprocal breeding, the Dandy Dwarf variety having yellow foliage, coarse leaves, and red fruits was combined both ways with the Yellow Cherry variety, a standard sort, with green foliage, fine leaves, and yellow fruit. From the records secured in the work 126 F_2 plants have been taken from each of the two sets of crosses as a basis for studying character transmission. The results are presented in tabular form and discussed.

In conformance with the results frequently secured in plant breeding the author found that the fruits of the F_1 plants exceeded in weight and size those of the F_2 plants. Summing up the study of F_2 plants from the reciprocal crosses it appears that for the Mendelian characters the seed parent in both combinations is more potent over the offspring than the pollen parent. With characters requiring averages for an expression of results, such as weight and size of fruit, the pollen parent is the more influential.

Generally speaking, the fruits of greater weight and size are produced by dwarf plants, green-foliage plants, coarse-leaved plants, and red-fruited plants. Extracted Dandy Dwarf plants, so far as the Mendelian characters are concerned, had unusually large fruits, and extracted Yellow Cherry plants for their segregation characters had comparatively small fruits.

Spraying for profit, H. E. WEED (*Cleveland, Ohio: Hort. Pub. Co., 1917, 22. ed., rev., pp. 79, figs. 38*).—The present edition of this handbook has been slightly enlarged (E. S. R., 38, p. 40).

Spraying fruit trees, J. H. MERRILL (*Kansas Sta. Circ. 66 (1918), pp. 8*).—Directions for making standard sprays, including spray schedules for apple, pear, peach, cherry, and plum trees.

Cost of production of apples in the Payette Valley, Idaho, S. M. THOMSON and G. H. MILLER (*U. S. Dept. Agr. Bul. 636 (1918), pp. 36, pls. 2, figs. 8*).—This is the fifth of a series of bulletins on the cost of apple production (E. S. R., 38, p. 844). It reports a detailed study in 1915 of the current cost factors involved in the maintenance of orchards and the handling of the crop on 38 representative bearing orchards in the Payette district in western Idaho.

The more important averages brought out by this study are summarized as follows: Size of farms studied, 53.39 acres; size of bearing apple orchard, 11.33 acres; investment per farm, \$20,689.62; investment per acre of bearing apples, \$613.16; trees per acre, 63.34; annual yield per acre, 337 boxes; net labor costs, \$103.40 per acre, 30.68 cts. per box (43.14 per cent of total annual net cost of production); all other costs, \$136.25 per acre, 40.43 cts. per box (56.86 per cent of total annual net cost of production); and total annual net cost of production, 71.11 cts. per box. The total cost of production was essentially the same under clean culture and under the mulch crop system of culture. The commercial orchards of the valley are made up largely of Jonathan and Winesap apples.

The authors conclude that the stability of the agriculture on these farms is due largely to the fact that, in the main, they have been developed along

more or less diversified lines. The diversified farms are more successful than the specialized fruit ranches on the average of a series of years.

Peach varieties and their classification, H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul. 918 (1918), pp. 15*).—A revision of Farmers' Bulletin 633 (E. S. R., 32, p. 338).

Factors in transportation of strawberries from the Ozark region, V. W. RIDLEY (*U. S. Dept. Agr., Bur. Markets Doc. 8 (1918), pp. 10, figs. 6*).—A discussion of factors involved in the transportation of strawberries, based on investigations conducted by this Department in northwestern Arkansas and southwestern Missouri in 1917 in cooperation with the railroads and leading strawberry shipping organizations. It is pointed out that the three fundamental requirements for successful shipping of strawberries are careful handling to prevent bruising and mechanical injuries, quickness of cooling after harvesting, and efficient refrigeration in transit.

Results obtained by the Department in the strawberry section of Louisiana have shown that decay in transit can be materially reduced by precooling the berries and loading into iced cars. In view of the delay to shipment caused by precooling for several hours, a successful effort was made in the present investigation to bring about rapid cooling in transit by salting the ice in the bunkers immediately after loading. Both this practice and the use of false floors was found to aid materially rapid refrigeration after loading. Diagrams are given showing the results secured in experimental cars and the manner of loading for best refrigeration.

Changes in the chemical composition of grapes during ripening, F. T. BIOLETTI, W. V. CRUESS, and H. DAVIS (*Univ. Cal. Pubs. Agr. Sci., 3 (1918), No. 6, pp. 103-130, figs. 18*).—The investigations reported in this paper were undertaken during the three years 1914-1916 to determine the changes in chemical composition of Vinifera varieties of grapes in California during the growing and ripening stages. Particular attention was given to increase in total solids and sugars, decrease in total acid, and changes in protein and cream of tartar in the must or juice of the grapes. The ripening of the leaves was traced by noting the changes in starch, sugar, acid, and protein content. A large number of varieties were included in the work. The methods of analyses are described and the results are presented in a series of tables and charts and fully discussed. A bibliography is given of American and European literature on the subject.

A number of factors were studied with reference to their effect upon the composition of samples taken on the same date as determined by the density and acid content of the must and juices. The authors found that young vines ripened their fruit earlier than did mature vines. Grapes located on the south side of the vine ripened more rapidly than those on the north side. Generally speaking, the bunches at the base of the cane ripened more rapidly than those near the tip, although this relation may be reversed in some instances. Variations obtained in the Balling degree of must from bunches of similar appearance and size from the same vineyard and gathered on the same day, as determined by samples of 5 lbs. each, indicate that it is difficult to select small lots of the same variety that will represent average samples. A considerable variation in composition of the berries was found to exist within the same bunch. All of the above factors, the authors conclude, must be taken into account in procuring samples.

The changes in must or grapes during growth and ripening of berries observed in the investigation as a whole are summarized as follows:

"The total solids remain fairly constant during the period of growth, corresponding to the period between setting of the berries and the time at which

the berries have reached almost full size but are still hard and green. From this point on, there is a rapid increase in total solids due to increase in sugar. After the period usually considered as full maturity is reached, the increase in total solids is slow. The question may be raised as to whether this last increase is due to an actual synthesis and secretion of sugar or other solids, or simply to evaporation of water. The fact that there is no change in the curve of the acid decrease at this time indicates that the same processes are continuing and that the increased Balling degree represents an actual increase of solids. This view is fortified by observations regarding the increase of weight of solids during the ripening of raisin grapes. It has been shown that the weight of dried grapes shows a continuous increase up to the highest degree observed, 28.75 Balling.

"The total sugar during the growth period comprises only a small amount of the total solids. During ripening the sugar rapidly increases and then constitutes a much greater proportion. During ripening the sugar curve follows the total solids curve closely. It is more or less the mirror image of the total acid curve multiplied by five, i. e., increases as the acid decreases.

"During the early stages of the growth of the berries the acidity increases owing to an increase of free acid. This is a fact that the authors have not found mentioned in the literature. During ripening the total and free acid rapidly decrease. After maturity is reached the decrease is very slow.

"There is a very slow, but usually fairly definite, increase in cream of tartar during ripening. This increase is very much less than the decrease in free acid, and therefore can not account for any great part of this decrease.

"The protein not coagulated by heat increased definitely during growth and ripening, although the increase was not so regular nor so marked as the increase in sugar or the decrease in total acid."

The difference between total solids and sugar "remained constant for the lower percentages of total solids decreased during the rapid ripening stage, and remained constant through maturity and overripeness."

Olive growing in Spain, W. T. GRACEY (*U. S. Dept. Com., Spec. Cons. Rpts., No. 79 (1918), pp. 34*).—A description of varieties grown, methods of cultivation, and the preparation of pickled olives.

The cultivated and wild citrus, A. GUILLAUMIN (*Les Citrus Cultivés et Sauvages. Paris: Augustin Challamel, 1917, pp. 80, figs. 22*).—A monograph on the wild and cultivated forms of citrus with reference to their characters, classification, and origin.

A dry blood-orange strain, A. D. SHAMEL (*Jour. Heredity, 9 (1918), No. 4, pp. 174-177, figs. 2*).—The author began a systematic study of bud variations in a commercial grove of Ruby blood oranges in the season of 1916-17. An illustrated account is here given of limb sports observed in this grove that produce juiceless oranges with straw-colored interior instead of the rich blood-like color and juicy fruit of the normal Ruby blood orange. Further studies of the trees in this orchard revealed the fact that there existed many limb sports bearing dry oranges. As a practical result of these observations fruits picked from such limbs are now excluded from the commercial pack of the orchard and all limbs of this nature, except those reserved for experimental purposes, are being removed.

Striking orange bud variations, A. D. SHAMEL (*Jour. Heredity, 9 (1918), No. 4, pp. 189-191, figs. 2*).—The author describes and illustrates some striking bud variations that have been observed for eight years on a "Thomson strain" tree of the Washington navel orange variety in one of the individual tree performance record plats near Riverside, Cal.

Reports on freeze injury to citrus trees for 1916 and 1917, with notes on orange culture in south Alabama, O. F. E. WINBERG, G. C. STARCHER, and C. L. ISBELL (*Alabama Col. Sta. Bul.* 199 (1918), pp. 3-26, pls. 7, figs. 3).—The results are given of a survey of freeze injury, chiefly to Satsuma orange and grapefruit trees in Baldwin and Mobile Counties, during freezes occurring in November, 1916, and in February and March, 1917. The data, which are presented in the form of maps and graphs and further discussed, were compiled from freeze reports on 1,360 orchards or parts of orchards containing 446,746 trees. Notes on cultural methods and varieties, together with a spray calendar for citrus fruit, are also included.

Of the total number of trees reported on 15.6 per cent of the Satsuma trees were killed outright and 8.5 per cent were killed to the bank. Twenty-eight per cent of the grapefruit trees were killed outright and 29 per cent were killed to the bank. Banking, i. e., hilling up dirt around the tree in the fall to 12 in. or higher from the ground, was practiced in about one-half of the orchards, and about 68.5 per cent of the trees which otherwise would have been damaged were saved.

The authors point out that the heavier losses from freezes in hollows and low areas as compared with losses on high areas can be largely avoided by selecting orchard sites with reference to air drainage, air currents, and freedom from windbreaks, swamps, and wind stops. "The most resistant trees to freeze were those which were most perfectly cultivated and fertilized and, therefore, most vigorous. The Satsuma is undoubtedly the most desirable of all citrus fruits for Alabama planting when considered for their commercial value and freeze resistance. A freeze which merely causes complete defoliation may not seriously affect the season's crop immediately following. Banking in most cases proved effective. Banking should be done in early November, but many orchards were saved by banking as late as January, the most damaging freeze of 1916-17 having occurred February 3, 1917. The final success of the orchard depends on proper spraying."

[Cacao experiments, 1910-1917], J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 4, pp. 176-198).—In continuation of previous reports (E. S. R., 36, p. 537) this report contains a record for the period 1910-1917 of all the plants included in the manurial, shade, pruning, and natural-yield experiments carried out at the River Estate (Trinidad and Tobago Department of Agriculture) and on private estates in both Trinidad and Tobago.

No conclusions have been thus far drawn from the work as a whole. The results as recorded in the natural-yield plats for several years indicate that it will be difficult to interpret the results of experimental work on specific cacao plats unless the natural yield of the plat is recorded for several years before the experiment is started. Variations in the yield of individual trees materially affect the plat yield. Heavy-bearing trees of the first year continue to be heavy bearers and light-bearing trees continue to be light bearers, thus indicating the need of seed selection in starting plantations. At the same time the variations in yield between plats have not increased or decreased in the same proportion from year to year.

Penetration of scion by stock, G. B. PATVARDHAN (*Jour. Heredity*, 9 (1918), No. 4, pp. 187, 188, fig. 1).—A brief illustrated account of a grafted rose in which three shoots of the common stock rose developed on the scion within the area of the callus but beyond the margin of the slit.

Something about cannas and their varieties, A. C. MILLARD (*Gard. Chron. Amer.*, 22 (1918), No. 3, pp. 86, 87, figs. 3).—Several American varieties of cannas, tested in the author's garden, are here briefly described.

Observations on tulips, II, A. B. STOUT (*Jour. Hort. Soc. N. Y.*, 2 (1918), No. 16, pp. 235-243, pls. 3).—In continuation of a previous paper (E. S. R., 37, p. 886) the author here discusses the abnormal and premature development of tulips; development of buds during summer, with special regard to the occurrence of blindness; and tulip rots. The discussion is based upon observations made at the New York Botanical Garden in 1917.

FORESTRY.

Forestry and community development, S. T. DANA (*U. S. Dept. Agr. Bul.* 638 (1918), pp. 33, pls. 8).—In this bulletin the author points out some of the harmful economic and social effects of forest devastation through destructive lumbering methods, and presents suggestions relative to the development of a rational timber-land policy.

Changes in the forest area of New England in three centuries, R. M. HARPER (*Jour. Forestry*, 16 (1918), No. 4, pp. 442-452, fig. 1).—The author presents and discusses a diagram worked out by methods herein described showing the estimated percentage of forest area in each New England State from 1620 to 1910. A list of reference literature is given.

The administrative report of the Virginia State forester for the calendar years 1916 and 1917, R. C. JONES (*Admn. Rpt. Va. State Forester, 1916-17*, pp. 81).—Among activities briefly considered for the years 1916-17 are educational work, forest fire protection, progress on study of forest conditions by counties, practical assistance to landowners, establishment of a demonstration forest and forest nursery, cooperation with the Federal Government in the National defense, and cooperation with the extension service of the Virginia Polytechnic Institute. The forestry laws of Virginia through the regular session of 1916 are appended.

Report of the director of forestry for the year 1917, R. H. CAMPBELL ET AL. (*Dept. Int. Canada, Rpt. Dir. Forestry, 1917*, pp. 81, figs. 23).—The report includes a review of the several lines of work conducted by the forestry branch during the year and detailed reports of the work of the tree planting division and on the forest reserves in the separate Provinces, together with the report of the Forest Products Laboratory of Canada.

Annual report of the crown land department of the Province of New Brunswick for the year ended October 31, 1917, E. A. SMITH (*Ann. Rpt. Crown Land Dept. New Brunswick*, 57 (1917), pp. 206, pls. 29).—In addition to a detailed report on the administration, management, and finances of the crown lands of New Brunswick, reports are included on various areas surveyed in 1917 in connection with the project to make a forest survey of all the crown lands of New Brunswick.

Forestry in the Dominion of New Zealand, W. SCHLICH (*Quart. Jour. Forestry*, 12 (1918), No. 1, pp. 1-28, figs. 4).—An account of forestry in New Zealand, based largely on information taken from the Oxford Survey of the British Empire. See also a previous note by Hutchins (E. S. R., 36, p. 448).

Report on experimental forestry at the Rhodes Estate, Matopos, W. E. DOWSETT (*Rhodesia Agr. Jour.*, 15 (1918), No. 2, pp. 136-147).—Notes are given on the adaptation and use of a large number of trees that have been tested in Rhodesia.

Forest trees of Maine and how to know them, F. H. COLBY, J. M. BRISCOE, and H. N. CONSER ([*Augusta, Me.*]: *Maine Forestry Dept.*, 1917, pp. 73, figs. 68).—In the present edition of this pocket manual (E. S. R., 21, p. 46), the text has been thoroughly revised and corrected to meet Maine conditions and several species have been added.

Native trees of Canada, B. R. MORTON and R. G. LEWIS (*Dept. Int. Canada, Forestry Branch Bul. 61 (1917), pp. 233, figs. 210*).—Descriptive accounts are given of over 100 tree species native to Canada, including in the case of the more important commercial species a brief paragraph on the physical properties and uses of the wood. Where a genus is represented by many species, their distinguishing features are arranged in tabular form. The text is accompanied by numerous illustrations of trees, bark, leaves, twigs, and fruit.

The Philippine forests, M. L. MERRITT (*Ames Forester, 5 (1917), pp. 5-12, pls. 4*).—A descriptive account of the Philippine forests with reference to their area, general composition, forest types, and estimated timber yield per acre of different types.

The forest flora of New South Wales, J. H. MAIDEN (*Sydney, N. S. Wales: Govt., vol. 6 (1913-1917), pts. 1, pp. 1-15, pls. 10; 2, pp. 17-36, pls. 6; 3, pp. 37-59, pls. 9; 4, pp. 61-82, pls. 11; 5, pp. 83-115, pls. 4; 6, pp. 117-144, pls. 9; 7, pp. 145-188, pls. 11; 8, pp. 189-234, pls. 9; 9, pp. 235-268, pls. 8; 10, pp. 269-308, pls. 25; index, pp. III-XVIII*).—This is the sixth of a series of volumes on the forest flora of New South Wales (E. S. R., 30, p. 446). In the present volume 38 species are described, each species being considered with reference to its botanical characteristics, common and scientific nomenclature, size, habitat, economic products, and propagation.

Intercellular canals in dicotyledonous woods, S. J. RECORD (*Jour. Forestry, 16 (1918), No. 4, pp. 429-441, figs. 8*).—A brief synopsis is given of the various families of the dicotyledons in which intercellular canals in the wood have been observed by the author or reported by others, including information on the origin of these canals and the nature of their contents. The study was made with special reference to the importance of intercellular canals as a factor in diagnosing different woods. A list of cited literature is given.

The seeds of forest trees and their place in British forestry, W. L. TAYLOR (*Quart. Jour. Forestry, 12 (1918), No. 1, pp. 28-43*).—In this paper the author discusses the possibility of developing the forest seed industry in the British Islands, consideration being given to the following phases: Home-grown v. imported seed, source of origin, seed years, maturity and seed fall, collection, storing, extraction, testing and germination, pests, and quantities and cost.

Seed vitality as a factor in determining forest types, J. V. HOFMANN (*Ames Forester, 5 (1917), pp. 13-16, pls. 5*).—In this paper the author briefly discusses some of the reasons for nature's apparent wasteful methods in establishing forest types and points out how these facts may be utilized by the forester. Consideration is given to seed production, seed distribution, seed germinability, and seed establishment.

Forest regeneration on certain cut-over pulpwood lands in Quebec, C. D. HOWE (*Com. Conserv. Canada Rpt., 9 (1917), pp. 55-72, pls. 2; Reprint, 1918, pp. 15*).—The author gives the results of some investigations conducted in St. Maurice Valley, Quebec, under the direction of the Commission of Conservation to determine the rate of replacement of pulpwood material by growth and by reproduction on cut-over lands.

The results of the investigation show that the good yields of pulpwood material at the end of each of the several cuttings in the past 30 years do not represent the amount of growth accrued during the intervals between cutting periods, but are obtained by cutting successively smaller trees and in general low-grade material, and also by replacing a larger proportion of spruce with balsam in each cut. From the standpoint of reproduction it takes 150 years for a spruce tree to reach the minimum diameter of 12 in. established by cutting regulations in Quebec. It takes balsam about 70 years to reach the minimum cutting diameter for that species of 7 in.

A plan to frustrate the white-pine blister rust in future commercial plantings, H. A. REYNOLDS (*Mass. Forestry Assoc. Bul. 118 (1916), pp. 2*).—This plan provides for the planting of white pines and red pines in equal numbers in future plantations. The two species may be alternated in the rows or planted in alternate rows. At the time of thinning, 15 or 20 years after planting, the white pines may be taken out if infected with the rust and the red pines allowed to mature. If the white pines are not infected the less valuable red pines may be removed.

A critical revision of the genus *Eucalyptus*, J. H. MAIDEN (*Sydney, N. S. Wales: Govt., vols. 2 (1910-1914), pts. 1-10, pp. XI+311, pls. 40; 3 (1914-1917), pts. 1-10, pp. 223, pls. 40*).—Corresponding to the first volume of this revision (E. S. R., 23, p. 45) the present volumes contain detailed descriptions of 117 species of *Eucalyptus*, including supplementary notes relating to the description, synonyms, and economic uses of the species.

Relative frost resistance of eucalyptus in southern California, E. N. MUNNS (*Jour. Forestry, 16 (1918), No. 4, pp. 412-428*).—Tabular data are given and discussed showing the effect of the low temperatures during the freeze of January 3 to 8, 1913, on different species of eucalypts of various ages in the San Bernardino Valley. A list made up from reports by different nurserymen in the region is given showing the relative hardiness of the species in the nursery. The temperatures to which the stock was subjected ranged from 14° to 24° F.

From the observations as a whole the species are classified in the following groups: Very resistant to low temperatures, resistant to low temperatures, frost sensitive but capable of recovering from injury, and very frost sensitive.

Utilization of wood waste, C. A. KUPFER (*Ames Forester, 5 (1917), pp. 17-21*).—A popular summary of recent developments in the utilization of wood waste.

DISEASES OF PLANTS.

Annual report of the Government botanist, W. SMALL (*Ann. Rpt. Dept. Agr. Uganda, 1917, pp. 39-40*).—Concluding a somewhat detailed report regarding diseases of coffee, cacao, Hevea, and other crops, the author states that Uganda is still favorably circumstanced as regards plant diseases. Problems pressing for attention are those regarding the rot and hardening of cacao pods, cacao stem canker, sterility in cacao flowers, coffee dieback, coffee broken beans, and cacao and Hevea dieback.

Report of the imperial mycologist, E. J. BUTLER (*Sci. Rpts. Agr. Research Inst. Pusa, 1916-17, pp. 52-70*).—Besides miscellaneous information, notes are given regarding ufra of rice due to *Tylenchus angustus*, tokra of Solanaceæ due to *Orobancha cernua* and of Cruciferæ due to *O. indica*, several species of Phytophthora on various economic hosts, Rhizoctonia and other sclerotial diseases, anthracnose of chili and legumes, tikka disease of peanut, sal tree disease (*Polyporus shoreæ*), and peach leaf curl.

Orobanche as a parasite in Bihar, F. J. F. SHAW (*Mem. Dept. Agr. India, Bot. Ser., 9 (1917), No. 3, pp. 107-130, pls. 4, figs. 6*).—Concluding a study of the tokras, which are said to be widely prevalent and injurious in Bihar, the author states that *O. indica* on mustard was not much lessened by the use of sodium nitrate. The results in case of *O. cernua* were not convincing. Weeding out the parasites before they have time to ripen seed appears to be more practicable in a region where labor is cheap. The slight climatic differences between two cold seasons may powerfully influence the development of *O. indica*. It is stated that this species contains at least two races, one parasitic on tobacco, the other on crucifers.

Rusts and smuts collected in New Mexico in 1916, P. C. STANDLEY (*Mycologia*, 10 (1918), No. 1, pp. 34-42).—Brief notes are given regarding the author's collection of Uredinales, obtained in northern New Mexico in the summer of 1916, comprising 55 species, of which 17 are thought to be new to the State.

A *Phyllachora* of the royal palm, J. R. JOHNSTON and S. C. BRUNER (*Mycologia*, 10 (1918), No. 1, pp. 43, 44, pl. 1).—A fungus, causing as yet only slight damage in a few cases to the royal palm (*Roystonea regia*) near Rincón, Cuba, is described as a new species under the name *P. roystoneæ*.

Cultures of Uredineæ in 1915, J. C. ARTHUR (*Mycologia*, 8 (1916), No. 3, pp. 125-141).—In the fourteenth of a series of reports on Uredineæ (E. S. R., 32, p. 750), the author presents 8 species that have been previously grown in cultures and reported by himself or other investigators and 4 species the culture of which is now reported for the first time.

Cultures of Uredineæ in 1916 and 1917, J. C. ARTHUR (*Mycologia*, 9 (1917), No. 5, pp. 294-312).—Species previously reported as having been cultured include 7 for 1916 and 4 for 1917, while species reported for the first time include 2 for each year.

North American species of *Puccinia* on *Carex*, F. D. KERN (*Mycologia*, 9 (1917), No. 4, pp. 205-238).—Giving the results of studies carried on for about ten years, the author lists and describes 19 species of *Puccinia* on *Carex*, with keys, synonyms, and host lists. Species considered as new are *P. kellermanii*, *P. spatiosa*, and *P. eminens*, while new combinations proposed include *P. urticata*, *P. lysimachiata*, and *P. asterum*.

Effect of soil temperature on the growth of bean plants and on their susceptibility to a root parasite, D. REDDICK (*Amer. Jour. Bot.*, 4 (1917), No. 9, pp. 513-519).—Beans were grown at 15, 22, and 34° C. in soil contaminated with a *Fusarium* before planting. At 22° the reduction in yield by the *Fusarium* was 34 per cent; at 34°, 25.5 per cent. The growth of *Fusarium* was also observed at temperatures ranging from 12°, which was apparently above the lower limit, to 39°, which appeared to be slightly above the upper limit, the maximum growth in length appearing to occur about 31°.

Cabbage diseases, I. E. MELHUS and I. H. VOGEL (*Iowa Sta. Circ.* 46 [1918], pp. 4, figs. 3).—Blackleg, black rot, club root, and yellows are described, and means of control suggested.

Broom rape on hemp, N. VAN POETEREN (*Tijdschr. Plantenziekten*, 23 (1917), No. 1, pp. 1-16, pls. 2, fig. 1).—An account is given of observations on *Orobanchë* (*Phelipæa*) *ramosa*, injuriously parasitic on hemp in the Dutch Communes of Wamel and Druten, Netherlands, where it is said to have been present for several years.

On forms of the hop (*Humulus lupulus*) resistant to mildew (*Sphærotheca humuli*), E. S. SALMON (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 455-460).—Two seedlings of *H. lupulus* were observed in 1914 to be very resistant to mildew (*S. humuli*). Both showed a few patches of mildew in 1916. Further facts are given in this connection, particularly regarding observations made during 1916 and since on seedlings of like origin. Some of these showed absolute resistance during that year, while others of the same stock were very susceptible to mildew.

Bacterial disease of *Pisum sativum*, DOROTHY M. CAYLEY (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 461-479, pls. 4).—Further study of the disease of *P. sativum*, formerly noted (E. S. R., 29, p. 245), has established the agency in this connection of a motile sporing facultatively anaerobic bacillus which is discussed under the proposed name *Pseudomonas seminum*. A prominent characteristic of the disease is its forming a discolored area in the center of each

cotyledon. External infection takes place through young tissues only. It has been found in most portions of the plant, but not in the vessels. It develops rapidly at 25° C., but slowly at 20°. All varieties of culinary peas thus far examined are susceptible. Germination is not arrested, but in severe cases growth is retarded.

Physiological diseases of potatoes, M. F. BARRUS (*Ann. Rpt. Quebec Soc. Protec. Plants* [etc.], 9 (1916-17), pp. 45-53, figs. 3).—This is mainly a discussion of leaf roll, curly dwarf, mosaic, and streak of potato, with some observations regarding the influence of heredity and the use for seed of potatoes of inferior size and appearance. Streak appears to be infectious and bacterial in its nature.

Studies in bacteriosis.—I, Blackleg of the potato, S. G. PAINE (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 480-494).—Giving the results of a study of potato diseases, limited in the work here reported to blackleg as it occurs in Lancashire, the author states that the causal organism is *Bacillus atrosepticus*. This he claims to be in all respects identical with the organism causing the corresponding disease in Ireland, described by Pethybridge and Murphy (*E. S. R.*, 25, p. 454) under the name *B. melanogenes*.

Potato mildew, A. FRAILE DE AULA (*Prog. Agr. y Pecuaria*, 23 (1917), Nos. 1020, pp. 314-316; 1021, pp. 326, 327).—For mildew (*Phytophthora infestans*) either Bordeaux or Burgundy mixture at 2 per cent strength is found adequate if made up to neutrality with lime or soda.

Modern methods of phytopathological research, JOHANNA WESTERDIJK (*De nieuwe wegen van het phytopathologisch onderzoek. Amsterdam: J. H. de Bussy*, 1917, pp. 38).—This is mainly a review of phytopathological work recently done in different countries.

Soil temperatures as a factor in phytopathology, L. R. JONES (*Plant World*, 20 (1917), No. 8, pp. 229-237, figs. 2).—Pointing out recent illustrations of the influence of soil temperatures upon plant disease, the author states that the necessity of securing constant temperatures for the study of correlation between climatic conditions and the occurrence of disease has led to the development of a plan upon which a brief preliminary report is made. By the employment of this plan temperatures ranging from 5 to 40° C. can be maintained with very small fluctuations.

Biological or physiological races of plant parasites and their economic significance, H. A. A. VAN DER LEK (*Tijdschr. Plantenziekten*, 23 (1917), Nos. 3, pp. 85-98; 4, pp. 137-164, fig. 1).—This is mainly a discussion of selected cases dealing with forms and degrees of specialization of parasites in relation with their hosts.

The beginnings and physical basis of parasitism, D. T. MACDOUGAL (*Plant World*, 20 (1917), No. 8, pp. 238-244, fig. 1).—Since 1908, experiments regarding the conditions under which a seed plant may parasitize another have been carried on at Tucson, Ariz., and reports on this work have been noted previously (*E. S. R.*, 26, p. 433). The present account refers to work done following the discovery of a cactus (*Opuntia blakeana*) naturally parasitic on a cactus of another genus (*Carnegia gigantea*), the physical relations with which are briefly indicated as rendering some degree of absorption possible, such limited absorption being further evidenced by the rapid growth of the parasite. A second case of undoubted and, in this instance, ancient parasitism is also cited.

In view of the findings of Harris and Lawrence (*E. S. R.*, 38, p. 125) on imbibitional phenomena the author has modified his own view as formerly expressed that a higher osmotic pressure of its sap is a necessary condition to

parasitism by one plant on another. This is said to be further evidenced from recent work at the Desert Laboratory, supposedly proving that the parasitic penetration is not conditioned necessarily and solely by osmotic balance. The younger haustorial cells are probably not vacuolated when they enter the host, and absorption by them occurs almost wholly by imbibition, which would be carried on even against any osmotic action of a vacuolated cell. The force of expansion of the invading protoplasts would be no less important. The pressure set up would, it is thought, be sufficient to cause mechanical penetration of the host, as it would be far greater than any force attributable to osmotic action. After the haustorium is mature osmosis is probably important. The proportion of nitrogenous substance in the parasite, the acidity, and the concentration of salts might be the determining factors in both the making and the maintenance of a nutritive couple of host and parasite.

Report of the committee on fungus diseases for 1916, T. F. MANNS (*Trans. Peninsula Hort. Soc. [Del.]*, 30 (1917), pp. 72-76).—As in previous reports (E. S. R., 36, p. 540), data from various sections of the country are summarized as bearing upon Delaware problems. A list of the principal diseases noted at different points in the State is included.

Insect and fungus control, E. N. CORY (*Trans. Peninsula Hort. Soc. [Del.]*, 30 (1917), pp. 62-71).—The spraying and dusting calendar herein presented is in two parts, one for the general farmer, the other for the commercial fruit grower. Information is also given regarding different protective applications and apparatus for their employment.

[Plant diseases in South Africa], I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt. 1916*, pp. 59-61).—Investigations are noted as carried out or begun with an oak disease; diseases of spineless cacti; internal brown fleck and early blight (*Macrosporium solani*) of potato; leaf spot (*Septoria lycopersici*) and blossom end rot of tomato; black rot of cabbage (*Bacterium campestris*); a bacterial blight of pear blossom; bacterial spot, Phoma disease, anthracnose, and canker of citrus fruits; black spot of mangoes; a dieback of fruit trees due to *Cytospora leucostoma*; an apple cracking disease (*Coniothectum chomatosporum*); dry rot (*Diplodia zeae*), kernel pinking, and leaf variegation in maize; bacterial wilt and root rot of alfalfa; and Polyporaceae, causing damage to forest trees and timber. Lists are given of related publications recently issued.

Wart disease of potatoes: Reports on the immunity trials at Ormskirk in 1915-1917 (*Jour. Bd. Agr. [London]*, 24 (1917), No. 8, pp. 801-818, pl. 1; *Bd. Agr. and Fisheries [London]*, Leaflet 21 (1917), pp. 19, pl. 1).—Wart disease, first reported in 1901, but known to have been present in some districts for many years previous, has become much more prevalent during recent years, the cultivation of susceptible varieties having greatly favored its injurious effects. Fungicidal treatment of the soil has proved useless up to this time, the fungicides effective in this connection also killing the potatoes. The results are here detailed of studies on varieties which are classed as immune, susceptible, or doubtful, and notes are given on some of the results obtained. The work is to be continued.

[Care of potatoes], LABERGE (Rev. Vit., 46 (1917), No. 1200, pp. 409, 410; 47 (1917), No. 1210, pp. 154-156).—Along with a brief statement of potato diseases due largely to unsuitable handling and storing, suggestions are given as to how losses from these causes may be lessened or prevented.

Lanas disease and its control, H. JENSEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies]*, Meded. 29 (1917), pp. 118, pls. 3).—This number deals in some detail with the causation and transmission of lanas disease of tobacco,

said to be due to a *Phytophthora* (E. S. R., 37, p. 533). Among the measures discussed as looking to control of the trouble are Bordeaux mixture as a spray for the beds and powdered lime for the older plants.

Canning tomatoes resistant to *Fusarium*, J. B. S. NORTON (*Trans. Peninsula Hort. Soc. [Del.]*, 30 (1917), pp. 77, 78).—Giving a brief account to date of attempts previously noted (E. S. R., 32, p. 147) to develop varieties of tomato resistant or rather tolerant to *Fusarium*, the author states that in four years during which he has continued this work he has been able to select several resistant strains which have thus far shown no undesirable features, yielding a good type of fruit in good quantity on infected soil. A number of these strains have been distributed among growers to be tried out in different environments and in relation to other tomato diseases and other drawbacks.

Crown rot of fruit trees: Histological studies, J. G. GROSSENBACHER (*Amer. Jour. Bot.*, 4 (1917), No. 8, pp. 477-512, pls. 7).—The histological studies herein briefly reported are considered when taken in connection with those previously noted (E. S. R., 36, p. 223), to indicate that crown rot and some related bark diseases are due primarily, not to the organisms usually associated therewith, but to injuries arising when adverse environmental conditions overtake trees having immature bark in certain regions, the bark rot being due chiefly to fungi which in some cases extend from severely injured bark to adjacent living portions.

Both macroscopic and microscopic examinations indicate that excessive tensions are developed during the production of the injuries. It is considered possible that in some cases the presence of metabolized foods of insufficient concentration to permit normal growth and maturation is the most significant form of immaturity. The occurrence of droughts appears to have a significant relation to the injuries. It is suggested that an adverse period in the environment occurring at such a time stops the further accumulation of the labile components of protoplasm, and a long retention of these elementary constituents, together with the enzymes which are present, may lead to catabolic processes eventually resulting in the death of the tissues involved.

Treatment of canker of foreign fruit trees, G. d'UTRA (*Bol. Agr. [Sao Paulo]*, 18. ser., No. 7 (1917), pp. 517-521).—This is chiefly a discussion of the effects of *Nectria ditissima* on fruit trees and its supposed relation to woolly aphids.

[Apple or cedar rust], H. S. JACKSON (*Trans. Ind. Hort. Soc.* 1916, pp. 56-69, figs. 5).—This includes a report, with discussion, on orchard experience with apple rust, which is said to be confined in this country to the region east of the Rocky Mountains. It is quite generally distributed throughout this area, causing serious trouble in Virginia, West Virginia, Ohio, Indiana, and Illinois.

The effect of severe infection may be noted in the decreased yield the next year or even the year after. Differences are noted in the susceptibility of varieties as to leaves or fruits independently each of the other. Spraying, while theoretically effective, is considered impracticable in general commercial orchards. Destruction of the cedars controls the trouble completely where it is thoroughly done, and this method is considered practicable where adequate cooperation can be secured. In particular cases, where ornamental or other interests are to be regarded, cutting off the galls, while expensive, is said to be effective.

Pear blight, C. A. McCUE (*Trans. Peninsula Hort. Soc. [Del.]*, 30 (1917), pp. 51-55).—Concluding an account of experiments made or reported, the author states that spraying with Bordeaux mixture when the trees are in bloom appears to offer some protection against pear blight.

Bacterial gummosis of stone fruits, H. F. BARSS (*Mo. Bul. Com. Hort. Cal.*, 7 (1918), No. 3, pp. 121-136, figs. 11).—In a condensed account of experiences and

observations, in part reported previously (E. S. R., 32, p. 644), it is stated that during 1917 bacterial gummosis of stone fruits was very severe on portions of the Pacific coast. Trees 10 or 12 years old, or even older, showed severe injury, the disease, moreover, extending not only to cherry as usual, but also to prunes and peaches. This unusual virulence is ascribed, at least in part, to the late spring and to the long delay in growth activity, which checks the disease, also in part to the survival during the winter of insect carriers of the causal organism (*Pseudomonas (Bacterium) cerasi*).

The discussion relates to the symptoms and other features of the disease, the damage done thereby, resistance and susceptibility, and control measures. Gumming itself may result from any one or more of many causes.

The organism is intercellular only. Resistance is found to differ widely with varieties.

Bacterial gummosis of apricots (preliminary report), J. T. BARRETT (*Mo. Bul. Com. Hort. Cal.*, 7 (1918), No. 3, pp. 137-140, figs. 4).—Examination of apricot trees affected with a gumming disease revealed close agreement with the features reported in the above-noted statement by Barss. The blossom appears to be the common, if not the principal, point of entrance for the organism.

Removal of diseased bark, disinfection with corrosive sublimate (1:1,000) in 50 per cent denatured alcohol, and application of asphaltum paint apparently saved large branches, and possibly some trees. These experiments, however, are regarded as preliminary.

A new peach disease in Indiana, J. OSKAMP (*Trans. Ind. Hort. Soc.* 1916, pp. 430, 431, figs. 2).—A peach disease, supposed to be new and apparently due to *Bacterium pruni*, appeared in Indiana in 1915, being confined to a small area in the southern part of the State. The trouble appeared first as a leaf shot-hole disease, and later attacked the fruit, the dropping of which, however, was ascribed to defoliation. While trees on poor soils or in unfavorable situations were badly attacked, those on good soil locations were almost free from infection.

The immediate action and the duration of efficacy of copper sprays, J. CAPUS (*Rev. Vit.*, 47 (1917), No. 1220, pp. 313, 314).—As bearing upon the problem of the relative efficacy of acid and basic copper sprays (E. S. R., 36, p. 650) for treatment of grape downy mildew, the author has experimented for two years with Bordeaux and Burgundy mixtures applied to grape leaves. He has found that either preparation of either acid or alkaline reaction is efficacious from the moment of its application, but that the acid sprays leave more of the leaf surface open to infection and also lose their efficacy in a short time.

Grapevines resistant to mildew, R. SALOMON (*Rev. Vit.*, 47 (1917), No. 1220, pp. 314-316).—This is a brief discussion of the qualities, period of bearing, etc., of a number of grape varieties said to be resistant to mildew.

Heat injury to the avocado, F. O. POENOE (*Cal. Citrogr.*, 3 (1917), No. 2, p. 29).—The injury done in the month of June, 1917, to avocado interests by the excessive heat is discussed. Conditions relied upon to prevent or minimize such injury are selected stock for planting, suitable shade during the first year, ample water for irrigation at the beginning of a hot period, and a mulch of straw as a safeguard against reflected heat.

Cacao diseases in Bahia, C. TORREND (*Broteria, Ser. Bot.* 15 (1917), No. 3, pp. 107-127, pls. 4, fig. 1).—The author discusses, among the known and more direct and important causes of loss now threatening the cacao industry in Bahia, various insects, along with the fungi *Corticium lilacino-fuscum* on the branches, also *Phytophthora faberi* on these and on the fruits. Among the more remote influences noted are inadequate cultivation, unfavorable soil conditions, and altitude.

Control of cacao canker, C. J. J. VAN HALL (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Lab. Plantenziekten, No. 30 (1917), pp. 10, pl. 1*).—Continuing to report on the operations against cacao canker in Kemiri, Pekalongan (E. S. R., 32, pp. 445-548), the author states that cutting out the cankers and treating the wounds made thereby with 20 per cent carbolineum has given beneficial results.

During the years 1913 to 1916, the number of infections on two areas subjected to systematic treatment steadily diminished.

Notes on fungus diseases of coffee, W. J. DOWSON (*Dept. Agr. Nairobi [Brit. East Africa], Bul. 2 (1917), pp. 44-48*).—It is stated that the coffee disease due to *Hemileia vastatrix* is the only coffee leaf disease that is now of considerable importance in British East Africa, though other troubles are present, among them *Cercospora coffeicola*, *Hymenochaete noxia*, and *Capnodium brasiliense*.

Phoëm necrosis of Liberia coffee in Surinam, G. STAHEL (*Meded. Dept. Landb. Suriname, No. 12 [1917], pp. 2*).—For a root disease attacking Liberia coffee during several years past in Surinam and showing some features strongly suggesting leaf roll of potato, also sereh of sugar cane, the author proposes the descriptive designation sieve tube disease (phloëm necrosis).

Diplodia fruit rot, dieback, and gummosis of Citrus, S. C. BRUNER (*Agriculture [Cuba], 1 (1917), No. 6, pp. 17-20, fig. 1*).—This is a discussion of the three forms of citrus disease caused by *D. natalensis*, of the ways in which attack by this fungus is favored, and of protective measures therefrom, including ventilation, cooling, and avoidance as far as possible of injury.

The citrus canker danger (*So. African Fruit Grower, 4 (1917), No. 2, pp. 33, 34, fig. 1*).—It is stated that citrus canker is becoming increasingly serious in South Africa.

Armillaria root rot of citrus trees, J. T. BARRETT (*Cal. Citrogr., 3 (1918), No. 4, pp. 77, 78, figs. 2*).—Cases are referred to in which infection of citrus trees by the Armillaria root rot was traced to diseased trees of several other genera. The results of experiments in attempting to check the spread of this fungus are given, and the causes of failure are indicated.

Diseases of orange and rose in Pernambuco, R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo], 18. ser., No. 5 (1917), pp. 417-425, figs. 5*).—Rose is attacked by *Phragmidium subcorticium*, *Sphaerotheca pannosa*, and *Marsonia rosæ*; orange by *Trichosphaeria* sp., *Myriangium citri*, and *Septoria arethusa*.

A new leaf-spot disease of Polygonum persicaria, P. J. O'GARA (*Mycologia, 9 (1917), No. 4, p. 248, pl. 1*).—A new leaf spot of *P. persicaria* is reported to be due to a Septoria which is claimed to be new, and which is described under the name *S. persicariae*.

Cryptogamic diseases of garden plants, R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo], 18. ser., 1917, Nos. 5, pp. 382-416, figs. 26; 6, pp. 486-515, figs. 24; 7, pp. 567-583, figs. 16; 8, pp. 634-654, figs. 12*).—This is a discussion of diseases of garden plants according to the causal organisms, including also measures of controlling these and other injurious agencies.

Root diseases of Hevea and clean clearing, W. N. C. BELGRAVE (*Agr. Bul. Fed. Malay States, 5 (1917), No. 8-9, pp. 318-326; Proc. Agr. Conf. Malaya, 1 (1917), pp. 55-63*).—It is stated that since the practical accomplishment of control of root disease in the case of Fomes, it has been recently discovered that Ustulina and Poria are common and destructive parasites of Hevea. It is also stated that more recently bark cankers have caused greater concern. The fungi at present known to cause Hevea root diseases of Malaya are *F. lignosus* (*F. semitostus*), *Sphaerostilbe repens*, *U. zonata*, *P. hypolateritia*, and *Hymeno-*

chæte noxia (brown root disease). These are discussed with reference to their management, which is necessarily almost wholly preventive, as the diseases are usually not discovered until the trees are past recovery. Root fungi can not be kept from entering the wounds, but the removal of jungle stumps, isolation of diseased trees by trenching, and other measures are briefly discussed.

Brown root rot [of Hevea], C. J. J. VAN HALL (*Teysmannia*, 28 (1917), No. 6, pp. 289-295).—The author gives a descriptive discussion of brown rot (*Hymenochæte noxia*) of Hevea as noted in various regions, with a list of contributions relating to this disease.

Notes on effect of dyes on *Endothia parasitica*, CAROLINE RUMBOLD (*Bot. Gaz.*, 64 (1917), No. 3, pp. 250-252).—This is an account of experiments regarding the growth of the chestnut blight fungus (*E. parasitica*) in a liquid medium, Pasteur's solution, to which had been added the vital stains Congo red, trypan blue, methylene blue, and neutral red plus 7 per cent common salt, the concentration of the first three being 1:1,000, and that of the fourth being unknown. The cultures were obtained from conidia mixed with a little mycelium from a test-tube culture. The results and deductions therefrom are detailed.

It is suggested that *E. parasitica* may prove to be suitable material for the study of mitochondria.

[A disease of the hemlock tree due to *Fomitiporia tsugina*] (*Mycologia*, 9 (1917), No. 6, p. 370).—A fungus was observed by P. Wilson at East Hebron, N. H., on a hemlock tree which was dead and prostrate in 1917. The fungus (*F. tsugina*) was broadly effused over the trunk. Living hemlocks near Bristol were also found to be attacked by this fungus, which also occurs on hemlock in New York. The disease is considered to require further investigation.

An undescribed timber decay of pitch pine, L. O. OVERHOLTS (*Mycologia*, 9 (1917), No. 5, pp. 261-270, pls. 2).—A disease which results in a characteristic decay of sapwood in *Pinus rigida* near State College, Pa., is ascribed to *Polyporus amorphus*, which has been noted also in *P. strobus*, *P. pungens*, and *Tsuga canadensis*.

Dry rot in timber, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales*, 28 (1917), No. 7, pp. 463-466).—These notes are derived largely from an article by Groom (*E. S. R.*, 37, p. 253) previously noted.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Poisonous animals of the desert, C. T. VORHIES (*Arizona Sta. Bul.* 83 (1917), pp. 357-392, pl. 1, figs. 15).—A summary of information relating to snakes, lizards, skunks, insects, spiders, mata venado or solpugids, scorpions, and myriapods.

The control of rodent pests, C. J. SORENSON (*Utah Sta. Circ.* 29 (1918), pp. 3-10, figs. 2).—Directions are given for the killing of ground squirrels, pocket gophers, jack rabbits, and field mice.

Sixteenth supplement to the American Ornithologists' Union check list of North American birds (*Auk*, 29 (1912), No. 3, pp. 239-387).—This comprises the first supplement to the third edition of the check list (*E. S. R.*, 24, p. 555).

Changes in the A. O. U. check list of North American birds proposed since the publication of the sixteenth supplement (*Auk*, 33 (1916), No. 4, pp. 425-431).—A summary of changes and additions proposed since the publication of the third edition of the check list (*E. S. R.*, 24, p. 555) and the sixteenth supplement noted above.

Second annual list of proposed changes in the A. O. U. check list of North American birds, H. C. OBERHOLSER (*Auk*, 34 (1917), No. 2, pp. 198-205).—This comprises further additions and changes in the names of North American birds. The first annual list of proposed additions and changes is noted above.

A cooperative bird census at Washington, D. C., H. C. OBERHOLSER (*Wilson Bul.*, 29 (1917), No. 1, pp. 18-29; *abs. in Jour. Wash. Acad. Sci.*, 8 (1918), No. 4, p. 37).—This is a detailed report, largely in tabular form, of a bird census taken on May 12, 1913, at the height of the spring migration in the vicinity of Washington, in which the author was assisted by 15 ornithologists. The country investigated consisted of the region within 20 miles of the city and comprised the valleys of the Potomac and Anacostia Rivers, together with their tributary streams and the adjacent uplands.

The total number of species observed was 129 and the individuals actually counted 12,257. The most numerous species in the order of their abundance were English sparrow, barn swallow, tree swallow, song sparrow, chimney swift, and catbird.

[Report on bird migration, April 1 to June 15, 1917, Washington, D. C.] H. C. OBERHOLSER (*Bird Lore*, 19 (1917), No. 4, pp. 211, 212).

The birds of Bawean Island, Java Sea, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus.*, 52 (1917), pp. 183-198).

A new subspecies of *Geothlypis beldingi*, H. C. OBERHOLSER (*Condor*, 19 (1917), No. 6, pp. 182-184).—A new subspecies, *G. beldingi goldmani*, is here described from Lower California.

Description of a new subspecies of *Perisoreus obscurus*, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash.*, 30 (1917), pp. 185-188).

A remarkable martin roost in the city of Washington, H. C. OBERHOLSER (*Bird Lore*, 19 (1917), No. 6, pp. 315-317).

The uses of insect galls, MARGARET M. FAGAN (*Amer. Nat.*, 52 (1918), No. 614, pp. 155-176).—This is a summary of an extensive study of the literature dealing with the uses of insect galls. A list of the common names of the insect galls which have been of any practical use—53 in number—and a bibliography of 65 titles are included.

Australian Hymenoptera Chalcidoidea, I-III.—Supplements, A. A. GIRAULT (*Mem. Queensland Mus.*, 2 (1913), pp. 101-139; 3 (1915), pp. 142-179).—In the supplements here given to the papers previously noted (E. S. R., 28, p. 563) additions have been made to the families Trichogrammatidae (vols. 2, pp. 101-106; 3, pp. 142-153), Mymaridae (vols. 2, pp. 107-129; 3, pp. 154-169), and Elasmidae (vols. 2, pp. 130-139; 3, pp. 170-179), which include descriptions of new genera and new species. A general supplement has been previously noted (E. S. R., 37, p. 855).

Australian Hymenoptera Chalcidoidea, IV-XIV, A. A. GIRAULT (*Mem. Queensland Mus.*, 2 (1913), pp. 140-334; 3 (1915), pp. 180-346; 4 (1915), pp. 365).—In continuation of the papers previously noted (E. S. R., 28, p. 563), descriptions of new genera and new species are given of the families Eulophidae (vols. 2, pp. 140-296; 3, pp. 180-299), Perilampidae (vols. 2, pp. 297-302; 3, pp. 300-312), Pteromalidae (vols. 2, pp. 303-334; 3, pp. 313-346); and of the families Encyrtidae (pp. 1-184), Miscogasteridae (pp. 185-202), Cleonymidae (pp. 203-224), Eucharidae (pp. 225-237), Eurytomidae (pp. 238-274), Calliomidae (pp. 275-309), Agaonidae (pp. 310-313), and Chalcididae (pp. 314-365) in volume 4.

On the larval and pupal stages of *Bibio johannis*, H. M. MORRIS (*Ann. Appl. Biol.*, 4 (1917), No. 3, pp. 91-114, pl. 1, figs. 12).—The studies here reported were conducted with larvæ of *B. johannis* taken from the soil of a permanent pasture in Cheshire. While several members of the family Bibionidae

are of economic importance, the author has found this species to feed upon decaying vegetable matter only.

The Mediterranean fruit fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr. Bul.* 640 (1918), pp. 43, figs. 33).—An abridgment of Bulletin 536 (E. S. R., 38, p. 658).

The melon fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr. Bul.* 643 (1918), pp. 31, figs. 23).—An abridgment of Bulletin 491 (E. S. R., 37, p. 566).

The Argentine ant in relation to citrus groves, J. R. HORTON (*U. S. Dept. Agr. Bul.* 647 (1918), pp. 73, pls. 6).—This is a report of investigations of the Argentine ant (*Iridomyrmex humilis*) which occurs in citrus groves in Louisiana and in California, in the latter State being especially numerous in parts of the citrus districts of Los Angeles and Riverside Counties. A general account of its distribution and control in the United States by Barber has been previously noted (E. S. R., 35, p. 761).

The author finds that the principal cause of the decline of orange trees and loss of crop in southern Louisiana, which has been largely blamed on the Argentine ant, is in reality due to cultural neglect. The only direct injury done by the ant is to destroy a negligible number of orange blossoms. The ants do not attend the armored scales of citrus or secure honeydew from them, nor do they disseminate the living scales, but they do disturb the predatory enemies of these scales, preventing the destruction of as large a proportion of them as would otherwise occur. It is pointed out that the natural enemies of the armored scales do not prevent heavy infestation even in orchards free from ants and that the ant can not prevent the control of the armored scales in Louisiana by spraying, nor will it increase the cost of spraying. Destruction of the ants will not control these scales and they must be controlled if orange growing in Louisiana is to be made profitable.

"Under present conditions the Argentine ant does not cause exceptionally severe infestations in the orange groves of Louisiana, even of those soft scales to which it is most favorable. The mealy bugs have not been of importance as an orange pest in ant-invaded orchards during the years 1913 to 1915, partly due to the effectiveness of natural enemies, especially certain internal parasites, partly to overcrowding of the trees by armored scales and white flies, and partly because of the poor physical condition of the trees.

"In Los Angeles County, Cal., where the trees are kept free from other scales and vigorously growing, the mealy bugs increase tremendously as a result of ant attendance. Ordinarily they are kept under complete control, where the ants do not occur, by their predatory enemies. In orchards where fumigation has been neglected and the trees become overcrowded with the black scale, the mealy bug does not benefit so much from ant attendance, and infestation is much milder."

The Argentine ant may be an active agent in the spread of diseases through its habit of visiting various parts of the tree, and particularly freshly made wounds, for the purpose of feeding, gummosis and wood-rotting fungi being introduced in this way more rapidly than would otherwise be the case. It may act as a conveyor of diseases of bacterial origin, such as the citrus canker, by carrying the causal organisms about on its legs and body.

If ants are deterred by barrier ditches from entering the groves rapidly, five or six fumigations of the box traps devised, about a month apart, should so reduce the worst infestations that annoyance from them will cease, and fumigation thereafter of a few of the traps once in every three to six months will suffice to prevent further molestation. "The estimated cost of reducing the ants from most extreme numbers to the few remaining where

there is effective control would be about \$6.03 per acre for labor and fumigant, or not to exceed \$16.03, including the first cost of traps and covers. It is believed that large sections of territory where the annual rainfall is heavy could be effectively and economically freed from ants by this method if all the members of the community would cooperate in the undertaking. Although the labor of ant destruction might be somewhat prolonged in cities because of the numerous buildings and other suitable nesting places, this method, it is believed, might be advantageously adapted to city use.

"Destruction of the ants in Louisiana orange groves will not effectively control the armored scales, or the white flies and the rust mite, and would not pay for itself in actual crop increase. Regardless of the ants many run-down orange groves in Louisiana can be so improved by one season's thorough spraying and cultural treatment as almost to double their production. The success of certain orchards in southern Louisiana demonstrates that oranges can be profitably grown there if the trees are carefully selected and planted and the best-known cultural practices and methods of insect control followed."

Control of the Argentine ant in orange groves, J. R. HORTON (*U. S. Dept. Agr., Farmers' Bul.* 928 (1918), pp. 20, figs. 6).—This is a summary of information on control measures, based upon the investigations above noted.

In Louisiana orange groves this pest can be controlled as an orchard and house pest by the trapping method, while in California orange groves the ants can be prevented from getting into the trees by banding the trees and their numbers can be reduced by poisoning.

The black cacao ant (*Dolichoderus bituberculatus*) and its importance in cacao culture in Java, P. VAN DER GOOT (*Meded. Proefstat. Midden-Java*, No. 25 (1917), pp. 142, pls. 4, figs. 4; *abs in Rev. Appl. Ent., Ser. A*, 5 (1917), No. 12, pp. 570-574).—A report of studies of the morphology and biology of this ant is followed by accounts of its relation with *Helopeltis*, the cacao moth (*Acrocercops cramerella*), the cacao mealy bug (*Pseudococcus crotonis*), etc. Studies of the cacao mealy bug and its natural enemies (pp. 90-114) and statistical data are appended.

The investigations have shown this ant to be an aid in protecting cacao trees against *Helopeltis*, both directly by preventing oviposition thereon and through the disturbance of *Helopeltis* by *P. crotonis*, which the ant attends. It also protects cacao to a considerable extent against the cacao moth, the other great pest of cacao in Java.

Notes in regard to bots, *Gastrophilus* spp., M. C. HALL (*Jour. Amer. Vet. Med. Assoc.*, 52 (1917), No. 2, pp. 177-184).—"Carbon bisulphid, in experimental test followed by post-mortem examination, is as highly effective against bots as clinical findings indicate. Neither chloroform nor oil of chenopodium are of any value in removing bots, so far as our experiments show; this bears out the clinical findings for chloroform and conforms to the probabilities for oil of chenopodium.

"*Gastrophilus intestinalis* (*G. equi*) is capable of incidental myiasis in dogs, when well-developed larvae from the stomach of the horse are fed to them, but *G. nasalis* and *G. hæmorrhoidalis* seem to have only a limited capacity for adaptation to conditions in the dog."

Reference is made to the investigations of Roubaud (*E. S. R.*, 38, p. 83), which indicate that the bot larva escapes from the egg when the horse bites or rubs his skin with his mouth and burrows into the buccal mucosa before proceeding to the stomach.

Note recording the proof that *Anopheles maculipennis* is an efficient host of the benign tertian malaria parasite in England, S. P. JAMES (*Jour. Roy. Army Med. Corps*, 29 (1917), No. 5, p. 615).—The author records the finding

of zygotes in different stages of development in two of six specimens of *A. maculipennis* which had fed on a benign tertian gamete carrier between August 30 and September 15 and which were dissected on September 17.

A note on the period during which the eggs of *Stegomyia fasciata* (*Aedes calopus*) from Sierra Leone stock retain their vitality in a humid temperature, A. BACOT (*Parasitology*, 10 (1918), No. 2, pp. 280-283).—The author records the emergence of a single larva from a batch of 1,000 eggs upon being immersed 13 months after oviposition. Twenty adults were reared from some 2,000 to 3,000 eggs stored for 15 months.

Mosquito growth in catch basins, J. W. M. BUNKER (*Amer. Jour. Pub. Health*, 7 (1917), No. 11, pp. 956-959).—The author's investigations have led to the following conclusions:

"Under ordinary conditions catch basins can and do serve as breeding places for mosquitoes. Depending on the season, mosquitoes may be expected to breed in catch basins in places of the same climatic conditions as Cambridge, Mass., from May to September. A sufficient amount of rainfall serves to wash out the basins to some degree and rid them of eggs and larvæ. This need be only 0.1 in. of precipitation if it be brisk. It is evident that oiling is efficient in reducing the number of mosquitoes coming from this source, and it appears that in some cases oiling of the streets to keep down the dust serves automatically to oil the catch basins."

Effective methods of fly control, T. J. HEADLEE (*Sci. Amer. Sup.*, 85 (1918), No. 2201, pp. 150, 151).—A paper read before the New Jersey Sanitary Association.

A further contribution on the biology of *Hypoderma lineatum*, S. HADWEN (*Canada Dept. Agr., Health Anim. Branch Bul.* 21 (1916), pp. 10, pls. 5).—A more extended account than that previously noted (*E. S. R.*, 37, p. 691) which has been summarized by the author as follows:

"*H. lineatum* may be captured out-of-doors as early as April 15 in exceptional years, but since it has been proved to withstand low temperatures it has probably been overlooked in other seasons, both at home and abroad. On two occasions it was captured in the absence of sunshine. Oviposition takes place principally when the animals are lying down. The longest time for the eggs to hatch on the cattle was seven days.

"Larvæ were made to penetrate pieces of skin, which had been removed from cattle. They crawled down the hairs and entered by way of the follicles. A single larva was found penetrating the skin of a cow under natural conditions. Two larvæ which had penetrated the skin were squeezed out. Serious skin lesions were caused by the penetration of the larvæ for which the name 'hypodermal rash' is proposed. The principal skin lesions were found from the point of the ischium to the hock, on the top part of the udder; from the point of the ischium to the patella, slightly on the flanks and abundantly on the sternum behind the elbow. The damage done to the hide by the larvæ entering is confined to the poorer parts of the leather, but the injury caused by the entrance of pus organisms and others may produce fatal diseases, such as anthrax and blackleg."

Observations on the migration of warble larvæ through the tissues, S. HADWEN and E. A. BRUCE (*Canada Dept. Agr., Health Anim. Branch Bul.* 22 (1916), pp. 14, figs. 7).—The authors have verified by observations the following facts on the course of the larvæ in the host:

"The larvæ are found in the submucosa of the esophagus and gradually work their way toward the diaphragmatic end of the esophagus. They may follow the posterior borders of the ribs under the pleura. They may enter the neural

canal. Evidences that the posterior foramen is the means of ingress and exit have been noted."

In summarizing it is pointed out that the following points have been established: "The larvæ follow connective tissue closely. In British Columbia they may perforate the skin of the back as early as December 15. The latest date on which larvæ were found in the gullet was March 15. Larvæ found in the esophagus, spinal canal, and subcutaneous tissue, all had about the same dimensions; signs of their migration through the intervening tissue were also found, proving that the process is continuous."

Habits of mosquitoes of the genus *Anopheles*, which transmit malarial fever in Panama, and their control in the interior, J. ZETEK (*Bol. Asoc. La Salle [Panama]*, 3 (1917), No. 32, pp. 10-13; 3 (1918), Nos. 33, pp. 8-13; 34, pp. 3-7).—In the first part of this paper the author deals with the classification and habits of the *Anopheles*, giving tables for the separation of both adults and larvæ; in the second part with antimalarial work in Cuba and the Canal Zone; and in part 3 with sanitation in the interior of Panama.

Experiments with a parasitic fungus of the cacao thrips, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1916-17*, pp. 11, 12).—Experiments in the parasitism of the cacao thrips by *Sporotrichum globuliferum* are briefly reported. Observations of this fungus in St. Vincent have been previously noted (*E. S. R.*, 36, p. 153; 37, p. 461). See also another note (*E. S. R.*, 38, p. 57).

Serious injury to the vine in Bengazi by a thysanopteran (*Dictyothrips ægyptiacus*), D. V. ZANON (*Agr. Colon. [Italy]*, 11 (1917), No. 6, pp. 394-397, pls. 2).—This is a brief account of *D. ægyptiacus*, which is a source of injury to the grape in Bengazi.

The black cherry aphid, W. A. ROSS (*Agr. Gaz. Canada*, 5 (1918), No. 1, pp. 13-16, figs. 5).—This is a brief report of experimental work at the Vineland Station, Ontario, with *Myrus cerasi*, where in 1915 it was very destructive to the sweet cherry.

The discovery was made that the aphids migrate in summer to wild pepper-grass (*Lepidium apetalum*) where they establish colonies of wingless lice and return in early autumn. It is pointed out that the pest is most vulnerable during the spring just before the buds break, at which time all the eggs have hatched and the young stem mothers feeding on the buds are without protection. Thorough spraying with blackleaf 40 at this time will destroy practically all the aphids.

Second report on the experiments carried out at Pusa to improve the mulberry silk industry, compiled under the direction of the imperial entomologist, M. N. DE (*Agr. Research Inst. Pusa Bul.* 74 (1917), pp. 27).—This is a report of further experiments with the silkworm (*E. S. R.*, 34, p. 552), in which success has been attained in establishing multivoltine hybrid races which will yield better cocoons than the pure multivoltine races generally reared in Bengal, Assam, and Mysore.

The maize stalk borer (*Calamistis fusca*), R. W. JACK (*Rhodesia Agr. Jour.*, 14 (1917), No. 6, pp. 707-717, pls. 2, fig. 1).—A report of biological studies of this pest and means for its control in Rhodesia. While the intensity of its attack varies considerably from year to year it is at times a source of very serious injury.

Cutworms.—How can they be controlled? J. W. SCOTT (*Wyoming Sta. Rpt. 1917*, pp. 162-164).—Directions are given for the control of cutworms.

Machines for the treatment of cotton seed against pink bollworm (*Gelechia*) *Pectinophora gossypiella*, G. STORRY (*Min. Agr. Egypt, Tech. and Sci. Serv. Bul.* 14 (1917), pp. 29).—The general principles of two classes of machines

invented for the treatment of the cotton seed for the destruction of the pink bollworm are described: (1) Those in which the destruction is brought about by fumigation, and (2) those which depend upon heat for their efficiency.

The orange Tortrix, cause of decay, H. J. QUAYLE (*Cal. Citrogr.*, 3 (1918), No. 6, p. 133, figs. 2).—A brief account of a lepidopteran which was responsible for losses in some groves in 1917, in the vicinity of Pasadena and Alhambra, to the extent of from 20 to 25 per cent.

Control of New Zealand flax grubs, D. MILLER (*Jour. Agr. [New Zeal.]*, 15 (1917), No. 6, pp. 303-306, figs. 4).—Further investigations (E. S. R., 38, p. 257) of the control of New Zealand flax grubs (*Xanthorhoe praepectata* and *Melanchra steropastis*) have led to the discovery of an ichneumonid parasite, which is the most important parasitic enemy of *X. praepectata*. The larva of this grub is also attacked by a larger ichneumon wasp and by *Syrphus ortas*.

M. steropastis, which attacks the edge of the flax leaf and not the lower surface as does *X. praepectata*, is attacked by a tachinid parasite (*Phorocera marginata*).

Keep this bug out, G. G. BECKER (*Arkansas Sta. Circ.* 35, pp. 4, figs. 7).—A brief account of the sweet potato weevil (*Cylas formicarius*), which has not yet been recorded from Arkansas, in which the importance of preventing its introduction and establishment in the State is emphasized.

The white pine weevil and its relation to second-growth white pine, S. A. GRAHAM (*Jour. Forestry*, 16 (1918), No. 2, pp. 192-202, figs. 6).—This is a report of investigations at the Minnesota Experiment Station of *Pissodes strobi*, which injures young white pines, Norway spruce, and to a lesser extent Scotch pine, by killing the terminal shoots.

"The eggs are deposited during the spring and early summer in the inner bark of the terminal shoots, and the larvæ work their way downward beneath the bark, girdling the shoot. They pupate in cells in the pith or beneath the bark, emerge as adults during August and September, and hibernate in the litter beneath the trees. The weevil is distributed throughout the range of the white pine, but the infestation is heaviest in the Eastern States. Young trees between the ages of 5 and 30 years are subject to attack. The weevil prefers thrifty, rapidly growing trees in the open. Generally speaking, the denser the stand the lighter the weevil injury.

"The most economical and effective method of controlling the weevil in forest plantations is by close planting, although other effective measures have been suggested for ornamental plantings or small plantations. Parasites and predacious enemies of the weevil help to keep it in check, although they can never be depended upon for the complete control of this pest. At present the white pine weevil is not a serious pest in Minnesota, although it may become so in the future, but in the Northeastern States it is worthy of serious consideration."

Damage to barley in Sweden in 1916 by the wheat midge, H. TEDIN (*Sveriges Utsädesför. Tidskr.*, 27 (1917), No. 1, pp. 34-42).—It is stated that in plat tests of 15 different strains of barley, *Contarinia tritici*, first noticed on two-rowed barley in Sweden in 1912, was responsible for losses in 1916 of from 4.3 to 33.2 per cent of the crop.

Summary of locust work for the fourth quarter, 1916, F. W. SOUTH (*Agr. Bul. Fed. Malay States*, 6 (1917), No. 1, pp. 21-30).—This is a summary of locust work carried on in continuation of that previously noted (E. S. R., 37, p. 849).

[Insect pests of the coconut palm in Malaya], R. M. RICHARDS (*Proc. Agr. Conf. Malaya*, 1 (1917), pp. 69-74).—The pests briefly considered are the brown, black, or rhinoceros beetle (*Oryctes rhinoceros*), the leaf beetle *Xylo-*

trupes gideon, the palm weevil or red beetle (*Rhynchophorus ferrugineus*), a leaf-eating beetle of the family Hispidæ (*Brontispa froggatti*), two hesperiid butterflies (*Hidari irava* and *Erionota thrax*), *Thosea cinereomarginata*, *Mathasenu* sp., *Brachartona catoxantha*, *Termes gestroi*, etc. See also a previous note (E. S. R., 38, p. 460).

[Insect pests in Anglo-Egyptian Sudan], H. H. KING ([Wellcome Trop. Research Lab.] *Ent. Bul.*, 1917, Nos. 4, pp. 7; 5, pp. 6; 6, pp. 3; 7, pp. 4).—These brief popular accounts deal, respectively, with The Pink Bollworm (*Gelechia*) *Pectinophora gossypiella* in the Anglo-Egyptian Sudan, whither it was introduced prior to 1913, but has as yet become a pest in but two localities; The Pink Bollworm and Measures for Its Control; The Sudan Cotton Bollworm (*Diparopsis castanea*), which probably occurs throughout Africa; and The Weed Hanbuk (*Abutilon* spp.) and Its Relation to the Cotton Growing Industry in the Anglo-Egyptian Sudan. Two or more species of *Abutilon* occur in the cotton-growing districts of the Sudan and serve as food for four of the major insect pests of cotton, namely, the Egyptian bollworm (*Earias insulana*), the cotton flea-beetle (*Nisotra uniformis*), the Egyptian cotton stainer (*Oxycarenus hyalinipennis*), and the pink bollworm.

Destruction of agricultural pests [in Cyprus], W. BEVAN (*Dept. Agr. [Cyprus] Ann. Rpt. 1916-17*, pp. 12-14).—Among the more important pests of the year against which control measures were directed mention is made of the vine worm (*Zygaena ampelophaga*), which was a source of serious damage; the Mediterranean fruit fly (*Ceratitis capitata*); a carob pest (*Cecidomyia ceras-toniæ*); and a wheat pest (*Oecophora temperatella*).

Common garden insects, R. L. WEBSTER (*Iowa Sta. Circ. 44* (1918), pp. 8, figs. 9).—A popular summary of information on several of the more important garden insects.

Two important vegetable pests, W. H. BRITAIN (*Col. Agr., Truro, N. S., Circ. 26* (1917), pp. 7, figs. 7).—A brief account is given of the potato stem borer (*Gortyna micacea*), which attacks the potato, corn, rhubarb, sugar beets, etc., having been introduced from Europe several years ago; and the zebra caterpillar, which stripped the leaves from whole fields of turnips, etc.

Spraying for the control of insects and mites attacking citrus trees in Florida, W. W. YOTHERS (*U. S. Dept. Agr., Farmers' Bul. 933* (1918), pp. 38, figs. 24).—In the present publication the author gives information in regard to the best equipment for Florida conditions and directions for preparing effective home-made insecticides, together with a spraying schedule which has proved satisfactory after four years of practical experience. It is pointed out that under Florida conditions spraying is the most effective method for the control of citrus pests. The spraying schedule recommended includes the use of paraffin-oil emulsions (Government formula), containing 1 per cent of oil, in May; lime-sulphur solution, 32° B. (1:50 to 1:75), June to July; paraffin-oil emulsions (Government formula), containing 1 per cent of oil, August 25 to October 31; and lime-sulphur solution 32° (1:50 to 1:75), November or December.

Some reasons for spraying to control insect and mite enemies of citrus trees in Florida, W. W. YOTHERS (*U. S. Dept. Agr. Bul. 645* (1918), pp. 19).—After calling attention to the fact that many who were previously opposed to spraying for the control of citrus insects are now adopting this measure, the author considers at some length data relating to injury by insects to trees and fruit, particularly the loss caused through the lowering of the grade of fruit, including reduction in size and quality. A brief account is then given of a spraying scheme for controlling citrus pests, as presented in the publication

above noted, together with data on the cost of spraying and the profits and benefits resulting. Of the total damage caused by insects and mites to citrus in Florida more than 95 per cent is due to six species, namely the citrus white fly, the purple scale, the rust mite, the red scale, the cloudy-winged white fly, and the red spider.

The data presented in this bulletin led the author to estimate that had the 1915-16 crop of oranges and grapefruit been sprayed according to the schedule recommended the growers of Florida would have increased their net returns by \$1,288,955. "There is no reason why the standard percentage of fruit in the higher grades can not be raised so that the percentage in the first, second, and third grades will be 35, 50, and 15 instead of, as at present, 13, 41, and 46. In one of several instances given, spraying increased the amount of fruit in the first and second grades from 24.6 to 94.9 per cent and reduced that in the third and fourth from 75.4 to 5 per cent; increased the amount in the first from 0.6 to 27.4 per cent and reduced that in the fourth from 16.4 per cent to zero."

Fumigation of citrus trees, R. S. WOGLUM (*U. S. Dept. Agr., Farmers' Bul.* 923 (1918), pp. 30, figs. 17).—A general account of approved methods of fumigating citrus trees with hydrocyanic acid gas for the control of scale insects and white flies, based in part upon investigations previously noted (*E. S. R.*, 25, p. 363).

Liquid hydrocyanic acid, H. J. QUAYLE (*Cal. Citrogr.*, 3 (1917), No. 2, pp. 23, 30, figs. 3).—This is an account of the methods used in making liquid hydrocyanic acid for citrus fumigation in California.

Poisoning by hydrocyanic acid gas, A. M. McINTOSH (*Med. Jour. Aust.* [1917], April 28; *abs. in Jour. Trop. Med. and Hyg.* [London], 20 (1917), No. 14, pp. 167, 168).—This reports upon a case of accidental poisoning during the course of fumigation work with hydrocyanic acid gas.

Insects and rodents injurious to stored products, E. N. COMY and H. S. McCONNELL (*Md. Agr. Ext. Serv. Bul.* 8 (1917), pp. 123-144, figs. 17).—A popular summary of information.

Control of insects affecting stored seed and food products, G. G. BECKER (*Arkansas Sta. Circ.* 33, pp. 8, figs. 12).—A popular summary of information.

Two experiments in house fumigation, H. MAXWELL-LEFROY (*Ann. Appl. Biol.*, 4 (1917), No. 3, pp. 115-118).—In fumigation experiments in a house infested with the house mite (*Glycyphagus domesticus*) the author demonstrated that cyanid and carbon bisulphid can be used together, that the escaping vapors are not offensive to neighboring houses, that neither gas damages the contents of a house, and that a single application at the rate of 1 lb. of cyanid to 700 cu. ft. and 1 lb. of bisulphid to 500 cu. ft. of space may be sufficient to destroy practically all of the mites. The hydrocyanic acid gas probably never penetrated the floors and the bisulphid did not saturate above the floor level.

In the second experiment a two-story house of 18,000 cu. ft. capacity infested with book lice (*Psocidae*) which was fumigated with 12 lbs. of tetrachlorethane and 12 lbs. of 130 per cent sodium cyanid was completely cleared of the insect.

Bloodsucking insects as transmitters of anthrax or charbon, H. MORRIS (*Louisiana Stas. Bul.* 163 (1918), pp. 3-15, figs. 2).—This is a report of experimental work carried on in the pathological laboratory for the past three years with the horn fly (*Hæmatobia irritans*), horsefly (*Tabanus* sp. near *nigrovittatus*), and two mosquitoes (*Psorophora* (*Janthinosoma*) *sayi* and *Aedes sylvestris*), which has shown all four to be capable of transmitting anthrax by feeding upon a healthy animal after sucking blood from an infected one. The results indicate that anthrax bacilli when ingested from the blood of a sick animal are mostly, if not entirely, destroyed in the digestive tracts of these insects.

In the experiments conducted, horn flies which fed upon infected guinea pigs as long as four hours before death transmitted the disease to healthy pigs from 2 of 17 bitten (11 per cent) and in one instance the disease was transmitted by horn flies that had fed upon an infected carcass 15 minutes after death. The greatest number of transmissions took place when horn flies fed upon the diseased animal shortly before its death. Horn flies which fed upon infected sheep 30 minutes before death and others 15 minutes before, at, and 15 minutes after death transmitted the disease to guinea pigs. The disease was conveyed from 16 per cent of the animals bitten by horseflies infected four hours before death and five minutes after death, respectively. Other horseflies fed within this period gave higher percentages, and the disease was transmitted by all of six flies which sucked blood at the time of death of the animal. It is stated that the large black horsefly *T. atratus* sometimes feeds upon carcasses 30 minutes or more after death and that virulent cultures of anthrax were obtained from the bodies of this fly, but it could not be induced to feed in captivity. The disease was transmitted by mosquitoes from 16 per cent of the infected animals fed upon three hours before death and 12 per cent of those fed upon 10 minutes after death.

Cultures were made of 1,218 "specks" from the horn fly and 11 produced colonies of anthrax, all being from those cultured within six hours after feeding upon an infected host. Two colonies were found in 318 specks from the horsefly, and one colony in 711 specks from mosquitoes. No attempt was made to feed anthrax spores to determine whether they pass through the digestive tract.

Report of the parasitologist, J. W. SCOTT (*Wyoming Sta. Rpt. 1917, pp. 151-155*).—This is a brief statement of the work of the year, which relates to the transmission of swamp fever in horses in continuation of the work previously noted (E. S. R., 37, p. 374), the life cycle of *Tania (Moniezia) expansa*, the life cycle of *Thysanosoma actinioides*, the life history of *Sarcocystis tenella*, and screen wire cloth durability tests.

Additional proof that swamp fever may be transmitted by the stable fly was secured and it was found that the virus may be transmitted by puncturing with an infected hypodermic needle. "A horse may contract the disease from bites of flies and for months show very little fever and few symptoms of the disease and still carry virulent blood. Apparent immunity to the disease may be developed and at the same time the horse may be a carrier of the virus. In subinjections the amount of blood used in a rough way bears an inverse relation to the length of the incubation period. This confirms findings of the Japanese Commission. The decrease in the total hemoglobin content of the blood is approximately proportional to the decrease in the number of red corpuscles. An attempt was made to transmit the disease by means of *Tabanus*. The results were doubtful in the one horse used in this experiment."

Report of the proceedings of the second entomological meeting, held at Pusa February 5 to 12, 1917, edited by T. B. FLETCHER (*Rpt. Proc. Ent. Meeting Pusa, 1917, pp. XII+340, pls. 35*).—This report of the meeting held at Pusa is prepared in such a way as to be an abstract of the present knowledge of Indian crop pests.

The predacious mite *Hemisarcoptes malus* and its relation to the natural control of the oyster-shell scale, *Lepidosaphes ulmi*, J. D. TOTHILL (*Agr. Gaz. Canada, 5 (1918), No. 3, pp. 234-239, figs. 3*).—A brief summary of information on this mite, which has been found quite regularly distributed, and, when the oyster-shell scale is abundant, the most important single factor operating toward the control of the scale in eastern Canada. In places where the host is less abundant the mite becomes proportionately less efficient.

Classification of the Hæmosporidia, C. FRANÇA (*Jour. Sci. Mat., Fis. e Nat., S. ser., No. 1 (1917), pp. 41, figs. 29; abs. in Trop. Vet. Bul., 5 (1917), No. 4, pp. 231-237*).—This is a revision of the classification of the Hæmosporidia.

FOODS—HUMAN NUTRITION.

Food chemistry in the service of human nutrition, H. C. SHERMAN (*Jour. Indus. and Engin. Chem., 10 (1918), No. 5, pp. 383-390*).—The question of the combination of adequacy of nutrition with the economic use of food from the conservation standpoint is discussed in detail. Excerpts from the article follow:

An adequate diet must provide a sufficient amount of digestible organic nutrients to yield the necessary number of calories. "The maintenance of an optimum degree of fatness (which as Symonds has shown is very near the average of healthy Americans) is usually the best evidence that the energy value of the diet is well adjusted to the needs of the individual. 'Counting the calories' in the food eaten is not necessary as a means of establishing the adequacy of the customary food intake if this is already established by the obvious condition of nutrition of the individual concerned, but if there be any question of prescribing the food—of rationing either an individual or a community—then adequate energy value of the ration is the first thing which should be considered, for only when the energy supply is adequate can the 'tissue-building' constituents of the body and of the food be conserved to the best advantage."

The material requisite of an adequate diet must furnish proteins in ample amount and of suitable sorts. ". . . It seems abundantly liberal to allow, when planning for an economic use of food, a protein 'standard' 50 per cent higher than the average estimate of the actual requirement (which, as already shown, is probably an overestimate). Such a 50 per cent margin for safety would lead to a tentative standard allowance of about 75 gm. of protein per man per day. The requirements of children for protein as well as other tissue-building material will be considered as proportional to their energy requirements and therefore much higher per unit of weight than in the case of adults."

The adequate diet must supply adequate amounts and proper proportions of the ash constituents, salts, or inorganic foodstuffs. As a result of dietary studies it is very strongly indicated that the average American dietary contain a much more liberal margin of protein than of either phosphorus or calcium and that while the danger of a protein deficiency is rarely serious, the danger of a deficiency of phosphorus or calcium is more important. "Phosphorus deficiencies are plainly more frequent than are deficiencies of protein, and calcium deficiencies are more frequent still. The old assumption that adequate protein may be taken as meaning adequate supplies of all tissue-building material is found to be wholly misleading."

The actual requirements for iron may average about 0.10 gm. and the corresponding standard be placed at 0.015 gm. per man per day. On this basis it would appear that the danger of a deficient intake of iron on freely chosen diet is much less than in the case of calcium but much greater than is the danger of a deficiency of protein.

The adequate diet furnishes enough of these as yet unidentified substances, the food hormones or so-called vitamins. The vitamin requirement can not be stated in terms of actual weight of fat-soluble A and water-soluble B, but the percentages of certain foods rich in the one or the other of these essentials which suffice to make an otherwise satisfactory diet adequate for normal growth and reproduction have been determined experimentally for several foods by

Osborne and Mendel and by McCollum, and his associates, so that the relative richness of several types of food in each of these dietary essentials is known in a general way and the factor of food value, in considering the prominence which should be given to each type of food in planning an adequate and economical diet, can be taken into account. "It is very interesting and important to find how generally the types of food rich in calcium—milk, eggs, vegetables—are rich in vitamins as well, so that in safeguarding against deficiency of the element most likely to be deficient. . . . at the same time . . . an ample intake of the food hormones or vitamins [is secured.]"

The adequate diet must include a sufficient amount of material of such physical character as to insure the proper handling of the food mass and its residue in the digestive tract. In applying the knowledge of nutritive requirements in the choice of food the author states that the average American dietary can be modified to meet all the wishes of the Food Administration and be materially improved at the same time. He points out that the duty placed upon the United States by the present food emergency to eat less meat and more of perishables, as milk, vegetables, and fruit, is what the recent advances in the knowledge of food and nutrition have shown to be for the best interest in every case. "A good general rule for families of any level of income or standard of living is to spend at least as much for milk as for meat, and to spend at least as much for vegetables and fruit as for meats and fish."

In regard to substitutes for wheat the author states that, "to the extent that the saving of white wheat flour means an increased use of the coarser flours and of oatmeal and potatoes in bread making (or potatoes in place of white bread), this also will result in an improvement in the mineral and vitamin content of the diet. To the extent that wheat flour is replaced by corn meal, we may anticipate no appreciable gain or loss in nutritive value."

The food habits of [the Armenians]—a people without nerves, H. C. TRACY (*Amer. Cookery*, 22 (1918), No. 9, pp. 644-646).—The author attributes the Armenians' ability to stand the strain of city life without loss of constitutional vigor to their sane food habits. Their diet is deemed well-balanced, the food wholesome, well cooked, and well seasoned. Their liberal use of matzoon and of fresh vegetables is specially noted. Some recipes for vegetable meat combinations often served by Armenians are given.

The nutritive value of the soy bean, AMY L. DANIELS and NELL B. NICHOLS (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 91-102, figs. 6).—Chemical analyses of soy beans and data from biological tests are recorded in this paper.

The authors conclude that the soy bean is one of the most valuable of the leguminous seeds. "It contains a high percentage of a physiologically good protein, a considerable amount of energy-yielding material in the form of fat and carbohydrate, and a fairly liberal supply of the fat-soluble food accessory, as well as of the water-soluble growth determinant.

"In order to make the soy bean a more nearly complete food, suitable inorganic material, consisting principally of sodium chlorid and calcium compounds, needs to be added."

A physical and chemical study of the Kafir kernel, G. L. BIDWELL (*U. S. Dept. Agr. Bul.* 634 (1918), pp. 5, fig. 1).—Chemical analyses of the Kafir corn kernel and its parts are reported and a comparison made with maize.

According to the author, the results obtained show that corresponding parts of the Kafir corn and maize kernels resemble each other in composition and appearance, and lead to the belief that if Kafir corn were handled in a manner similar to that used in the preparation of maize products, Kafir corn products might be substituted for the corresponding maize products.

How to grow the tomato and 115 ways to prepare it for the table, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 36* (1918), pp. 39).—Methods of cultivation are described, also remedies for diseases and insect pests. Recipes are included.

The commercial freezing and storing of fish, E. D. CLARK, L. H. ALMY, and M[ARY] E. PENNINGTON (*U. S. Dept. Agr. Bul. 635* (1918), pp. 9, figs. 8).—The process and effect of freezing and storing on fish, as carried on under commercial conditions, are discussed.

"Freezing and freezer storage will hold fish for many months in the condition in which they were received, but will not repair deterioration due to previous heating or mishandling. Freezers should accept only fish that are in prime condition. Unless delivered within three or four hours after being taken from the water, fish should be kept under refrigeration in the boats. Rapid freezing at as low temperature as possible is necessary in many plants in order to insure a good product and to handle receipts as they arrive. Glazing by inclosing the fish in an envelope of ice prevents loss of moisture, protects the fish from molds and bacteria, and makes them less subject to mechanical injury. Fish to be stored for more than three to five months should be reglazed occasionally, as in time the glaze evaporates, even at low temperatures.

"The most economical temperature for storing fish is probably at some constant temperature between 0° and +10° F., although some freezers hold that lower temperatures tend to delay evaporation of the glaze. Boxing fish before storage helps to prevent loss of glaze and protects the product from mechanical injury. Properly frozen fish reach the retailer in excellent condition. He should keep them hard frozen until they are sold. The practice of thawing fish by warming or in water greatly lessen their food value and flavor. Chemical analyses show no significant changes in fish held 27 months, or for a period much longer than would be necessary or profitable in storing fish commercially."

The influence of cold shock in the sterilization of canned foods, L. D. BUSHNELL (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 432-436).—Thirteen series of experiments were made to determine the influence of various procedures used in canning vegetables to insure sterilization, including (1) the effect of heating to boiling temperature for 5-20 minutes and suddenly cooling by plunging into ice water; (2) the effect of intermittent heating followed by cold shock; (3) the necessity for complete sterilization; and (4) the result of hermetically sealing. Peas, string beans, beets, and green corn were used and one series of control experiments was made with cultures from spoiled canned goods. The conclusions reached by the author were as follows:

"Blanching is of no value in reducing the time necessary to properly process canned foods. Small amounts of salt are of little value in preventing the growth of bacteria in canned foods.

"Small amounts of organic acid (acetic acid) have a distinctly retarding action upon the growth of bacteria in canned vegetables. The use of small amounts should be advocated in all cases in which it will not injure the texture, flavor, or appearance of the product.

"In many cases an unsterile product will keep indefinitely if properly sealed. This, however, is not true in all cases, and sealing should not be expected to take the place of proper processing because of the danger of loss due to spore-forming anaerobes."

Farm home conveniences, MADGE J. REESE (*U. S. Dept. Agr., Farmers' Bul. 927* (1918), pp. 32, figs. 25).—The household conveniences described in this publication have been selected because they may be made at a moderate cost

by anybody who has a few simple tools and the ability to use them, and are based on the extension work in home economics of this Department. The descriptions include a kitchen cabinet, fireless cooker, sponge box or bread raiser, dish drainer, blocks for raising tables, serving tray, folding ironing board and rack, iceless refrigerator, cold box, equipment for making butter and cheese, shower bath, a simple water-supply system (by R. W. Trullinger), fly trap, cook-stove drier or evaporator, cleaning closet, etc.

ANIMAL PRODUCTION.

Studies on the composition and nutritive value of clover hay and clover silage in Montana, E. BURKE, G. E. SMITH, and M. J. BLISH (*Montana Sta. Bul. 117* (1917), pp. 57-72).—The investigation here reported, which is in continuation of work already noted (E. S. R., 31, p. 673), involved analyses of a considerable number of samples of freshly cut red clover and of the silage made from the same clover, the object being to study the chemical changes which occur when clover is put in the silo. The results are compared with the work of other experiment stations. The digestibility of clover hay and clover silage was also determined in experiments with steers.

In reference to the changes which occur during the ensiling of clover it is noted that a considerable loss in dry matter occurs during the ensiling process. Although the fresh clover contained 4.68 per cent of reducing sugars, there was no trace of any in the silage. There was an increase in the nonprotein nitrogenous compounds and a corresponding decrease in true protein. There was a gain in ether extract which is attributed to the formation of organic acids developed during the fermentation of the carbohydrates. No significant change was noted in the mineral constituents and only a slight increase in the percentage of crude fiber.

A comparison of freshly cut clover, clover hay, and clover silage showed a lower protein content for the clover hay than for the silage or the freshly cut clover. The nitrogen-free extract was higher in the clover hay, but there were slight losses in ash, fiber, and ether extract. Some loss in nonprotein nitrogenous compounds occurred during the curing of clover as hay, but these compounds were increased during the ensiling of clover. The calorific value was highest in the silage and lowest in the freshly cut clover.

In the digestion experiments with 2-year-old Hereford and Shorthorn steers the following results were obtained:

Coefficients of digestibility of clover silage, clover hay, and timothy hay with steers.

Ration.	Dry matter.	Crude protein.	True protein.	Ether extract.	Crude fiber.	Ash.	Nitrogen-free extract.	Calorific value.
	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
Clover silage, 1912-13.....	68.77	70.24	51.13	78.52	52.31	45.85	79.00	68.78
Clover silage, 1914-15.....	63.90	65.02	52.13	77.99	49.45	43.65	74.07	63.03
Clover hay, 1914-15.....	66.20	67.39	63.27	61.34	49.48	49.96	76.51	64.85
Timothy hay, 1912-13.....	57.87	53.80	45.60	64.80	56.44	39.53	63.25	56.70

Relative feeding value of crops of alfalfa (*Nevada Sta. Rpt. 1917, pp. 57, 58*).—A chemical investigation was made of over 100 samples of alfalfa from different parts of the State in the attempt to explain the purported differences in feeding value of the separate crops or cuttings. It was found that a definite

relation exists between the ash and nitrogen content of the different crops of alfalfa. Averaging all the analyses the percentages of ash were as follows: First crop, 8.07; second crop, 7.75; third crop, 8.32; and fourth crop, 9.37. The corresponding percentages for nitrogen were 2.4, 2.27, 2.61, and 3.18. On the assumption that the feeding value of the crop lies in its ash and nitrogen content it is concluded that the fourth crop should be the best feeding material, the third the next, then the first, and lastly the second crop. It is stated that this order has virtually been established by the farmers of the State in their feeding practices.

Composition and digestibility of feeding stuffs grown in Hawaii, M. O. JOHNSON and KIM AK CHING (*Hawaii Sta. Press Bul. 53 (1918), pp. 26*).—All the analyses of Hawaiian feeding stuffs that have been made by the station are tabulated and arranged in form convenient for comparison with standard tables of American feeding stuffs. A table is also given showing the estimated digestibility and nutritive ratios of the various feeds. In making up this table it has been assumed that the average digestibility of Hawaiian feeding stuffs is approximately the same as that of similar American feeding stuffs.

Commercial feeding stuffs, W. J. JONES, JR., E. G. PROULX, C. CUTLER, R. B. DEEMER, and J. H. ROOP (*Indiana Sta. Bul. 209 (1917), pp. 3-342*).—In addition to notes on the objects, provisions, and administration of the State feeding stuffs law, a table compiled from various sources showing the average digestion coefficients of feeding stuffs, and definitions and descriptions of feeds, the results are tabulated and summarized of the inspection during 1916 of 3,877 samples of feeding stuffs representing 2,017 brands and 851 manufacturers. Complete analyses, representing in many cases only 1 sample, but in the majority of instances composites of from 2 to 228 samples, of the following feeding stuffs are tabulated: Wheat bran, wheat middlings, red dog flour, low-grade flour, ground rye, rye middlings, oat middlings, ground cowpeas, alfalfa meal, animal by-products, dried beet pulp, coconut oil meal, ground corn, corn bran, corn red dog flour, gluten meal, gluten feed, hominy feed, cottonseed feed, cottonseed meal, brewers' and distillers' dried grains, malt sprouts, vinegar grains, linseed meal, unscreened flaxseed oil feed, barley refuse, malted barley, and miscellaneous mixed and proprietary feeds. Other tables show the details of inspection, the results of microscopic examination of samples, shipments removed from sale, and feeding stuffs registered for sale during 1917-18.

Indiana feeding stuffs control, E. G. PROULX (*Indiana Sta. Circ. 72 (1917), pp. 6*).—A résumé of Bulletin 209, noted above, explaining the feeding-stuffs law and its enforcement, but not reporting analyses.

A method of calculating economical balanced rations, J. C. RUNDLES (*U. S. Dept. Agr., Bul. 637 (1918), pp. 18*).—The methods herein described are based upon the principle of alligation. By means of a series of tables of values the following may be readily estimated: The excess protein of nitrogenous feeds used in specified nutritive ratios, the protein deficiencies of carbohydrate feeds in specified nutritive ratios, the corresponding values of grains per bushel and per 100 lbs., and the relative cost per pound of the digestible protein and digestible carbohydrates of various feeds.

Computing rations for farm animals, E. S. SAVAGE (*New York Cornell Sta. Bul. 321, rev. ed. (1916), pp. 3-68, figs. 4*).—This is a revised and enlarged edition of this bulletin (E. S. R., 28, p. 364), to which are appended tables showing the composition of feeding stuffs and modified Wolff-Lehmann feeding standards for farm animals, compiled mainly from Feeds and Feeding by Henry and Morrison (E. S. R., 34, p. 261), the digestible composition of stated

amounts of common feeding stuffs, the cost of 100 lbs. of total digestible nutrients in different feeds at varying prices, and the fertilizing constituents per ton of feeding stuffs as returned in the manure of dairy cows.

[*Animal husbandry work in Alaska*], C. C. GEORGESON, J. W. NEAL, and M. D. SNODGRASS (*Alaska Sta. Rpt. 1916, pp. 12-15, 49, 50, 58-62, pl. 1*).—Experiments with Galloway cattle at the Kodiak Station have shown that this breed is well adapted to the climate. The most undesirable feature of the breed for Alaska conditions is the poor milking qualities of the cows. Efforts are being made to overcome this difficulty by crossbreeding with Holstein-Friesians. A serious prevalence of tuberculosis was discovered in the herd during the summer of 1916 and an attempt is being made to free the herd of this disease by the Bang method. Notes are given on the management of cattle under the conditions that obtain at the Kodiak Station.

The Kodiak Station flock of sheep was wintered at Kalsin Bay on a ration of hay and silage. Beginning March 25 the pregnant ewes were fed, in addition to hay and silage, rolled barley, cracked corn, and linseed meal (2:2:1). The flock wintered in fair condition, and 11 of the 14 lambs were saved. The spring clip of 1916 averaged 7.5 lbs. of wool of fair quality per head. Attention is again called to the menace of the brown bear to the sheep industry in this locality.

At the Fairbanks Station it is estimated that at present prices for feed the feed cost of raising a colt to four years old is \$680. Experiences of farmers in the vicinity are noted, indicating the unprofitableness of hog raising in the interior of Alaska. The station herd of hogs was received in 1914 and consisted of four yearlings and two 2-year-old hogs. Since then sales have amounted to \$912.88, and the present herd consists of three old hogs and three pigs from the 1916 litters. The feed cost of the herd during this period has amounted to \$2,081.81.

[*Feeding experiments with beef cattle*], E. W. SHEETS (*West Virginia Rpt. 1915-16, pp. 23-26*).—In investigations as to the best and most economical rations for wintering beef cattle, during the winter of 1914-15, 32 yearling steers were fed 140 days at the station in four lots, lots 1 and 3 being in open shed and 2 and 4 in open lots. Lots 1 and 2, on timothy hay, gained 0.26 lb. and 0.12 lb., respectively, per head daily, at a total feed cost of \$18.31 per head. Lot 3, on clover hay and corn silage, gained an average of 0.3 lb. per head daily, at a total feed cost of \$13.71. Lot 4, on 0.85 lb. of cottonseed meal supplementing wheat straw and silage, lost 0.25 lb. per head daily, the total feed cost being \$10.68. The following summer the steers in these lots on pasture for 128 days made gains of 298, 320, 296, and 334 lbs. per head, respectively. The experiment was continued during the winter of 1915-16, 32 beef calves being fed for 147 days in four lots. In this test lots 1 and 3 were in open shed and 2 and 4 in open lots. Lot 1, on a ration of timothy hay, corn silage, and 0.54 lb. of cottonseed meal, gained an average of 0.26 lb. per head daily, at a total feed cost of \$10.86 per head. Lot 2, on rye hay, corn silage, and 0.59 lb. of cottonseed meal, gained 0.13 lb. per head daily, at a feed cost of \$10.29. Lot 3, on clover hay and corn silage, gained 0.27 lb. per head daily, at a feed cost of \$9.89. Lot 4, on timothy hay and a grain mixture of corn, bran, and linseed meal (3:1:1), gained 0.3 lb. per head daily at a feed cost of \$14.88 per head.

At Lewisburg in the winter of 1914-15, 3 lots of 10 yearling steers each were fed for 128 days in open sheds with the following results: Lot 1, on timothy hay or corn stover, corn silage, and wheat straw, lost 0.25 lb.; lot 2, on corn silage, wheat straw, and 1 lb. of cottonseed meal, gained 0.57 lb.; lot 3,

on timothy hay or corn stover and wheat straw, lost 0.56 lb. The following summer these steers on pasture for 168 days gained a total of 336, 255, and 315 lbs. per steer for the respective lots. The experiment was repeated in the winter of 1915-16. In this test the steers in lot 1, on corn silage, mixed hay, and wheat straw, exactly maintained their weight for 122 days. During the same period lot 2 gained an average of 0.66 lb. per head daily on silage, wheat straw, and 1 lb. of cottonseed meal, and lot 3 lost 0.06 lb. per head daily on mixed hay and wheat straw. The following summer these lots gained in 28 days on pasture an average of 41, 6, and 28 lbs. per head, respectively.

In the fall of 1915 a cooperative experiment on the cost of raising beef cattle in the State was started at Lewisburg. Thirty cows and heifers of the three principal beef breeds were bred to drop calves during the winter and spring. They were fed in three lots for 122 days with the following results: Lot 1, on corn silage, mixed hay, and wheat straw, lost an average of 0.25 lb. per head daily; lot 2, on corn silage, wheat straw, and 1.5 lbs. cottonseed meal, gained 0.52 lb.; and lot 3, on mixed hay, wheat straw, and 15 lbs. of shocked corn, gained 0.09 lb. per head daily.

[Pasture survey of West Virginia], I. S. Cook (*West Virginia Sta. Rpt. 1915-16, p. 16*).—In a pasture survey of the State 246 farmers were interviewed in six representative grazing counties. With these farmers the average gain estimated per acre was about 126 lbs. for a yearling steer, 84.5 lbs. for a 2-year-old, and 69.4 lbs. for a 3-year-old, or a general average of 93.3 lbs. per season. With beef at 7 cts. per pound, this gain gives an average acre return of \$6.50 for land. From this it is concluded, with land worth \$34.45 per acre, two or three dollars an acre may be expended for pasture improvement.

Five years' calf-feeding work in Alabama and Mississippi, W. F. WARD and S. S. JERDAN (*U. S. Dept. Agr. Bul. 631 (1918), pp. 53*).—The experiments reported are a continuation of those already noted (*E. S. R., 27, pp. 372, 673*).

The first part of the present bulletin deals with the profitableness of raising and fattening calves for the market by the time they are a year old, and southern feeds and combinations of feeds that may be used for fattening calves during the winter months. In the first experiment three lots of high-grade calves from 6 to 8 months old, averaging 376 lbs. in weight, were fed at Sumterville, Ala., for 107 days, beginning November 17, 1911. Lot 1, 16 calves, were fed cottonseed meal, cottonseed hulls, and mixed alfalfa and Johnson grass hay; lot 2, 15 calves, cottonseed meal and corn-and-cob meal (2:1), cottonseed hulls, and mixed alfalfa hay; lot 3, 16 calves, the same ration as lot 2, except that the cottonseed meal and corn-and-cob meal were mixed in the proportion of 1.2. The calves were confined in half-acre paddocks and had access to open sheds. The average daily gains per head for the calves were 1.94 lbs. for lot 1, 1.75 for lot 2, and 1.59 for lot 3. At current prices for feeds the feed costs per pound of gain in the different lots were 5.14, 5.72, and 6.43 cts., respectively. With an initial value of 4 cts. a pound for the calves and a selling price of 5.5 cts. a pound on the farm, after a 3 per cent deduction on farm weights, the profits per calf averaged \$5.40, \$4.30, and \$4.07 for the respective lots. In this experiment pigs were allowed to follow lots 2 and 3. In addition to the undigested corn from the droppings the pigs were fed shelled corn. The pigs in lot 2 gained 805 lbs. on 3,715 lbs. of corn; and those in lot 3, 689 lbs. on 2,953 lbs. of corn. When the profits from the pigs were added the profits on each calf were increased to \$4.97 in lot 2, and to \$4.78 in lot 3.

During the winter of 1912-13, in the same shelter and lots that were used in the above test, 46 calves from 6 to 8 months old, averaging 371 lbs. each, were fed from November 29 to March 3, as follows: Lot 1, cottonseed meal and cut-

tonseed hulls; lot 2, cottonseed meal and corn chop (2:1), cottonseed hulls, and corn silage; and lot 3, cottonseed meal, cottonseed hulls, and corn silage. On March 3 the calves were thrown into one lot and fed cottonseed meal, corn chop, cottonseed hulls, and mixed hay until April 29. During the silage period the average gains were 1.49, 1.23, and 1.49 lbs. per head daily for lots 1, 2, and 3, respectively. The feed cost per pound of gain in this test was 5.59 cts. for lot 1; 6.09 cts. for lot 2; and 5.13 cts. for lot 3. During the 58 days following the silage period the calves gained 1.09 lbs. per head daily at a feed cost of 11.31 cts. per pound of gain.

In 1914 the cooperative cattle feeding work was transferred to Mississippi, and the tests were continued under farm conditions at Abbott, in the tick-free section of the black prairie belt. For 143 days, beginning November 13, 40 calves, averaging 400 lbs. each, were fed in three lots in open barns. The calves in each lot were fed a ration of 5.5 lbs. of cottonseed hulls, 3.5 lbs. of alfalfa hay, and all the silage they wanted. In addition, lot 1 received cottonseed meal; lot 2, cottonseed meal and corn-and-cob meal (2:1); and lot 3, cottonseed meal and corn-and-cob meal (1:2). The average daily gains per head were 1.71, 1.87, and 1.59 lbs. for lots 1, 2, and 3, respectively. At the prevailing feed prices for the year the feed cost per pound of gain was 6.34 cts. for lots 1 and 2, and 7.4 cts. for lot 3.

In the winter of 1915-16 on the above-mentioned farm in Mississippi three lots of 7- to 8-month-old calves that had just been weaned were fed for 156 days on a concrete floor under shelter. The calves were fed about 4.5 lbs. of alfalfa hay per head daily and all the silage they wanted, and in addition lot 1 consumed daily per head 3.69 lbs. of cottonseed meal, lot 2, 1.49 lbs. of cottonseed meal and 6.01 lbs. of shelled corn, and lot 3, 8.78 lbs. of shelled corn. The average daily gains per head were 1.74, 1.7, and 1.8 lbs. for the three lots. The calves in lot 1 were inclined to grow and did not fatten so rapidly as those in the other two lots. These calves were valued at 5 cts. per pound at the beginning of the test, and at the close they were shipped to St. Louis and sold for 8.17, 8.58, and 8.66 cts. per pound for the respective lots. Each lot made very satisfactory profits. During the 156-day period there was saved from each calf in lot 1 29.16 lbs. of manure daily, 26.17 lbs. from lot 2 and 21.29 lbs. from lot 3. No bedding was used, and the manure was scraped up and weighed daily. Some of the liquid manure was lost.

In order to determine the best method of preparing for market calves that are dropped too late in the spring and summer to be profitably fed during the following winter, a number of such calves were allowed to nurse their dams during the winter of 1915 and were weaned in the spring and fed on pasture for fall market. In addition to pasture, the calves were fed cottonseed cake or a mixture of cottonseed cake and shelled corn. The summer of 1916 was unusually dry, and consequently the pastures were very poor. The calves in lot 1 were fed 1 lb. of cottonseed cake per head daily at the beginning. This was increased to 3 lbs. at the end of the second 28-day period and to a maximum of 4.5 lbs. at the end of the third period, which amount was fed the rest of the summer. Lot 2 was started on 0.5 lb. of cottonseed cake and 1 lb. of corn per head daily. This was doubled by the end of the second 28-day period, and by the end of the third period they were getting 3 lbs. of cottonseed cake and 6 lbs. of shelled corn, which amount was fed until the end of the grazing period. The average daily gain per head during the 179 days was 1.41 lbs. for lot 1 and 1.63 lbs. for lot 2. These calves were placed in dry lot on October 30, and continued on the same grain rations with corn silage for roughage. For the 67-day finishing period the average daily gains per head were 1.49 lbs. for

lot 1 and 1.52 lbs. for lot 2. The corn-fed calves were fatter and had a higher dressing percentage in slaughter tests than the cottonseed meal calves. Eight shotes which followed the calves in lot 2 from November 7, 1916, to January 5, 1917, with no feed other than what they picked up behind the calves, gained 470 lbs. in weight, or almost 1 lb. per head daily. With feeds at current prices, silage at \$3 per ton, and pasture at 50 cts. per calf per 28-day period, and valuing the calves at 5 cts. per pound at the beginning of the test and 8.05 cts. for lot 1 and 8.48 cts. for lot 2 at the close at St. Louis, there was a profit of \$10 per calf for lot 1 and \$9.64 per calf, not including pork, for lot 2.

The bulletin closes with a general discussion of the results of the entire five years' experiments.

Digestion experiments with sheep, J. B. LINDSEY, C. L. BEALS, and P. H. SMITH (*Massachusetts Sta. Bul. 181 (1917), pp. 241-335*).—Digestion experiments made since the autumn of 1912 are reported. In the majority of experiments the basal ration was English hay or English hay and gluten feed. In nearly all the tests the experimental period extended over 14 days, the first 7 of which were preliminary. The complete data for the experiments are tabulated, including analyses of the feeding stuffs used.

A summary of the results is given below:

Coefficients of digestibility obtained with sheep.

Ration.	Number of single trials.	Dry matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
		<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
Alfalfa.....	4	57.74	42.61	71.78	46.40	65.12	23.62
Cabbage (entire).....	2	87.92	56.97	86.13	91.03	95.86	69.72
Cabbage (heads).....	2	97.83	77.29	76.54	112.27	102.32	42.67
Cabbage (leaves).....	2	74.12	44.97	63.80	78.23	84.34	37.39
Carrots.....	8	100.95	64.40	89.05	129.47	104.75	114.66
Corn bran.....	5	80.59	.....	43.77	75.92	85.15	65.53
Distillers' grains.....	4	66.54	36.31	77.05	44.44	67.38	83.70
English hay—basal.....	23	59.47	36.31	49.78	64.10	62.35	46.34
English hay and gluten feed—basal.....	14	66.59	33.25	66.39	67.75	69.91	51.89
English hay, potato starch, and gluten meal—basal.....	6	73.27	20.16	72.98	63.54	80.67	37.16
English hay and wheat gluten flour.....	5	58.00	43.00	44.00	62.00	61.00	43.00
Feterita.....	2	74.51	.....	50.67	.....	87.76	58.70
Gluten feed.....	16	91.59	152.58	85.44	142.41	93.77	64.41
Gluten meal.....	6	86.00	.....	85.00	100.00	93.00	.....
Mangels.....	4	87.07	30.58	50.94	95.54	94.76	.....
Garbage tankage.....	3	79.22	73.64	37.60	131.30	89.60	123.50
Proprietary pig meal (73 per cent garbage tankage).....	2	69.14	44.49	69.37	22.32	83.71	138.33
Pumpkins (entire).....	7	80.69	65.40	76.61	61.05	88.69	91.60
Pumpkins (seeds removed).....	2	101.54	82.31	93.26	116.34	105.72	92.63
Rowen.....	2	60.99	34.40	60.33	68.10	63.47	32.27
Soy bean hay.....	2	56.65	20.44	74.88	52.56	59.75	59.31
Proprietary dairy ration.....	2	70.57	26.03	79.69	50.19	70.91	81.48
Sudan grass (green).....	4	69.04	47.30	72.42	75.56	68.50	72.54
Sudan grass hay.....	8	57.49	50.11	57.96	68.19	50.98	28.66
Sweet clover (green).....	4	69.45	48.45	78.07	57.76	63.76	51.19
Turnips.....	2	88.98	53.36	75.62	81.65	96.06	66.38
Vegetable Ivory meal.....	8	88.33	78.42	18.47	85.52	93.84	49.18
Vinegar grains.....	4	60.70	.....	64.42	58.10	55.97	82.57

[Range carrying capacity and methods of handling sheep on ranges] (*Nevada Sta. Rpt. 1917, pp. 75-77, figs. 5*).—Carrying-capacity tests on summer grazing ranges indicate that the average acreage per sheep per 100 days, counting two lambs equal to one ewe, is 1.82 acres. These observations were made where the range plants were mostly grasses and weeds with a scattering growth of browse.

The rapid destruction and disappearance of the white sage (*Eurotia lanata*) on ranges, due to improper winter grazing methods, are noted. In feeding experiments with sheep in which cottonseed cake was used as a supplement for white sage winter range, the use of a concentrate under such conditions proved profitable and desirable. Cottonseed cake prevented losses due to sore mouths and starvation during storms. The digestion system of the sheep was kept in excellent condition, the ewes were in good condition at lambing time, and the yearlings and 2-year-olds were kept in good growth.

With eight flocks of sheep, five of which were herded under the old existing method of returning to a permanent bed ground each night and three flocks allowed to bed where night overtook them and to graze at all times as quietly and openly as possible, the results showed a saving of from 10 to 20 per cent in the acreage of range required, depending upon the efficiency of the herder, and an increase of from 4 to 7.5 lbs. in the weight of the lambs under the latter system.

The place of sheep on New England farms, F. H. BRANCH (*U. S. Dept. Agr., Farmers' Bul. 929 (1918), pp. 29, figs. 6*).—The purpose of this publication is to show (1) the relative importance of the industry and the place that sheep now occupy on New England farms, (2) the returns from sheep as compared with dairy cattle, and (3) the more important difficulties experienced by sheep growers and the practices followed in handling these troubles. The estimated number of all sheep in New England on January 1, 1918, was 360,000, whereas the number of sheep, exclusive of lambs, in the region in 1850 was approximately 2,257,600.

From a study of conditions on a large number of farms in Maine, New Hampshire, and Vermont in 1915, it was found that each sheep sheared an average of 6.5 lbs. of wool, and 75 lambs were raised for every 100 ewes kept. With wool at 22 cts. and lambs at 6.5 cts. per pound, the estimated average receipts per head of sheep kept (yearlings included) prior to 1916 were \$4.78, or \$33.46 per animal unit (7 sheep). During the same period the receipts per animal unit of dairy stock (1 cow or 2 head of young cattle), including the estimated value of skim milk, were \$75.52. The feed and labor costs during the period are estimated at \$38.50 per animal unit of sheep and \$67.35 per animal unit of dairy stock. On this basis the sheep lacked \$5.04 per animal unit of paying for feed and labor, and the dairy stock left a margin of \$8.17 over these costs. Assuming the same relative returns from sheep and dairy cattle, it is estimated that for 1917 prices the net profit over feed and labor cost per animal unit of sheep was \$33.18, as compared with \$12.72 from dairy stock.

The possibility for the improvement and expansion of the sheep industry in New England is pointed out.

The sheep-killing dog, J. F. WILSON (*U. S. Dept. Agr., Farmers' Bul. 935 (1918), pp. 32, figs. 2*).—This publication, which supersedes Farmers' Bulletin 652 (E. S. R., 32, p. 866), presents a general discussion of the subject, points out the great annual loss due to the stray dog, and describes a fence tried out by the Forest Service and found to be proof against dogs and coyotes.

A digest of existing State dog laws, given for the guidance of those interested in promoting legislation against sheep-killing dogs; and the complete dog laws of Pennsylvania and West Virginia, given as being examples of modern laws which really offer protection to flockmasters, are appended.

Alkali and weathering studies with wool, J. I. HARDY ET AL. (*Wyoming Sta. Rpt. 1917, pp. 164-169*).—Investigations upon the effect of alkali salts on the strength of wool fiber under range conditions and under more severe conditions planned in the laboratory are summarized.

The results of analyses of 16 samples of wool from range ewe fleeces are tabulated, showing on an air-dry basis the percentages of moisture, ether extract, cold-water extract, pure wool fiber, and sand, dirt, etc., in the wool. The water extract of these samples of wool was ashed, and its sodium, potassium, calcium, and magnesium contents were determined. The results are tabulated, together with the average breaking strength of from 100 to over 1,000 fibers of each sample. The effects of alkali and weathering upon the breaking strength of the fibers under range conditions do not seem to be notable. The breaking strengths of sets of these samples were then determined after treatment for one week with (1) 10 per cent sodium carbonate, (2) 10 per cent sodium sulphate, and (3) 10 per cent magnesium sulphate. It was noted that the breaking strength of the wool was but slightly affected by these treatments with alkaline solutions.

Using the same 16 wools, sets of samples of crude wool (wool in grease) and scoured wool were next treated for one year as follows: (1) Allowed to weather without alkali treatment, (2) treated with 10 per cent sodium carbonate and weathered, (3) treated with 10 per cent sodium sulphate and weathered, and (4) treated with 10 per cent magnesium sulphate and weathered. Treatments 2, 3, and 4 were repeated every week or ten days throughout the year. The breaking strengths were then determined. It was found that the untreated crude wool had a greater breaking strength than the clean wool or any of the treated samples. The clean wool, while somewhat weakened in the cleaning, was also stronger than any of the treated samples. Samples treated with sodium carbonate while weathering had the smallest average breaking strength of any of the samples. The sodium sulphate and magnesium sulphate treatments had practically the same effect on the average breaking strengths.

The use of hogs in disposing of crops, F. KNORN (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1916, pp. 11, 12*).—Results are given of grazing plats of alfalfa and corn with hogs in 1916, together with a summary of the four years 1913 to 1916 (*E. S. R., 36, p. 170*). The hogs were kept on the alfalfa from early spring until fall, with a supplementary ration of corn at the rate of 2 lbs. for each 100 lbs. of live weight. Two lots of hogs were used in the grazing test. The first lot of pigs was farrowed the previous autumn and taken off pasture June 28. The second lot was farrowed in the spring and began grazing June 29. At 7 cts. a pound for pork and 60 cts. a bushel for corn the net return from the first lot was \$64.64, and from the second lot \$82.32, or \$146.96 for the season of 1916. With alfalfa pasture at \$7 per acre for the first lot and \$8 for the second lot and corn at 60 cts. per bushel, the feed cost of producing a pound of gain was 3 cts. for lot 1 and 2.8 cts. for lot 2. The average feed cost per pound of gain for the four years was 3.04 cts. With an average yield of 5.78 tons of alfalfa hay per acre the hogs paid the equivalent of \$25.41 a ton for the 1916 crop.

The hogs made 840 lbs. of gain per acre of corn, the estimated yield being 66.9 bushels per acre. The average return per acre of corn for the five years 1912 to 1916 was 748 lbs. of pork.

Grazing crops for hogs, L. W. OSBORN (*Arkansas Sta. Circ. 36, pp. 4*).—A plan for a succession of crops for hog pasture is outlined, and notes are given on the culture and value of various crops for grazing swine.

Forage for swine, J. J. YOKE (*West Virginia Sta. Circ. 28 (1918), pp. 4*).—Notes are given on lowering the cost of producing pork by the use of forage crops, together with suggestions for the proper use of grain supplements for forage and plans for seeding and grazing forage plats.

The self-feeder in pork production, W. J. CARMICHAEL (*Illinois Sta. Circ. 218 (1918), pp. 8, figs. 3*).—Notes are given on the types of self-feeders that have been found satisfactory in tests at the station, and hints and precautions are outlined for their successful use in swine production.

In feeding experiments at the station in which pigs averaging 47 lbs. were fed shelled corn and tankage in self-feeders, the daily feed consumption per head ranged from 2.1 lbs. of corn and 0.4 lb. of tankage during the first period of four weeks to 3.8 lbs. of corn and 0.54 lb. of tankage during the third four-week period and 7.3 lbs. of corn and 0.26 lb. of tankage during the final 24 days following the fifth four-week period. At the end of the test the pigs averaged 259 lbs. in weight each, and they gained an average during the test of 1.3 lbs. per head daily. A second lot fed middlings in addition to corn and tankage consumed practically the same amount of corn and tankage as those in the first lot, and in addition more than twice as much middlings as tankage. This lot gained at the rate of 1.4 lbs. per head daily and had a final weight of 277 lbs. each.

Sorghum grains v. corn for fattening swine, H. E. DYORACHEK and H. A. SANDHOUSE (*Arkansas Sta. Circ. 34, pp. 4*).—The object of the experiment here noted was to determine the relative feeding value of the grains of Kafir corn and feterita for fattening pigs. Fifteen shotes averaging about 116 lbs. each, in three lots of five each, were fed as follows: Lot 1, Kafir corn and tankage (9:1); lot 2, feterita and tankage (9:1); and lot 3, corn and tankage (9:1). The grains were ground and mixed with the tankage.

The average daily gains per pig were 1.46 lbs. for lot 1, 1.47 lbs. for lot 2, and 1.2 lbs. for lot 3. To produce 1 lb. of gain it required 3.33 lbs. of Kafir corn and 0.37 lb. of tankage for lot 1, 3.3 lbs. of feterita and 0.37 lb. of tankage for lot 2, and 4.02 lbs. of corn and 0.45 lb. of tankage for lot 3. The results of this experiment indicate that when Kafir corn and feterita can be purchased at the same price as corn or cheaper they may be substituted economically for corn for fattening swine.

The influence of peanuts and rice bran on the quality of pork, L. B. BURK (*Texas Bul. 224 (1918), pp. 5-14, fig. 1*).—The purposes of this experiment were to determine (1) the value of peanuts as hog feed; (2) the kind of pork peanuts will produce; (3) whether soft or oily pork can be profitably hardened by feeding a grain ration; (4) whether or not hogs can be prevented from getting soft grazing on peanuts by feeding a half grain ration; (5) the kind of pork produced by milo maize and rice bran; and (6) the feeding value of the different rations. The experiment involved 12 lots of 10 pigs each, averaging 107 lbs. per head. The different lots were started at varying intervals, beginning October 12, 1916, and all the lots came off the experiment January 19, 1917. For 20 days or more previous to the experimental periods all the hogs were fed a balanced grain ration of milo maize chop and meat meal. All the lots except 1, 2, 11, and 12 grazed on peanuts or were fed peanuts in dry lots.

The hogs grazing on peanuts produced an average of 158 lbs. of pork per acre, the estimated yield of peanuts being 19 bushels. The peanut-fed hogs that were finished on grain were changed gradually from peanuts in order to prevent the animals from going off feed. The success of this method is indicated by the fact that every lot made its best gains during the week of the change. The lots on cottonseed meal and milo maize were fed for 80 days without any signs of cottonseed meal poisoning.

Some of the results of the feeding and slaughtering tests are given below:

Effect of peanuts and rice bran on pork.

Lot.	Ration.				Daily gains per head.		Feed per pound of gain.	Shrinkage in shipping.	Condition of carcass after 24 hours in cooler.	
	Grazing crop.		Grain.		On peanuts.	On dry lot.			Firm.	Oily.
	Kind of crop.	Period.	Kind of grain.	Period.						
		Days.		Days.	Lbs.	Lbs.	Lbs.	P. ct.	No. of hogs.	No. of hogs.
1			Milo chop.....	80	-----	1.07	5.11	3.0	10	
2			Cottonseed meal, milo chop (1:6).	80	-----	1.46	4.26	2.4	10	-----
3	Peanuts.	80		80	1.335	1.44	3.18	.1	1	
4	Peanuts.	80	Milo chop (half ration)	80	1.530	1.53	-----	.9	5	
5	Peanuts.	80	Cottonseed meal, milo chop (1:6, half ration).	80	1.550	2.07	1.93	2.3	5	
6	Peanuts.	40	Cottonseed meal, milo chop (1:6).	30	1.450	1.91	5.65	2.7	10	-----
7	Peanuts.	40	.....do.....	45	1.310	1.76	4.63	4.7	10	-----
8	Peanuts.	40	.....do.....	60	1.748	1.64	4.24	4.9	10	-----
9	Peanuts.	40	Milo chop.....	45	1.315	1.61	5.03	3.0	10	-----
10	Peanuts.	40	Meat meal, milo chop (1:10).	45	1.327	1.74	4.66	1.8	10	-----
11		-----	Cottonseed meal, rice bran (1:10).	80	-----	.85	5.83	9.0	15	14
12		-----	Cottonseed meal, rice bran, milo chop (1:4:4).	80	-----	1.34	4.65	4.0	10	-----

¹ One pig removed, sick.

At the beginning of the test two hogs from a check lot were slaughtered and placed in a cooler and held at a temperature of 32° F. After 24 hours they were firm. At the end of 40 days four hogs that had grazed with lot 8 on peanuts were slaughtered and held at freezing temperature. These carcasses were soft and oily both at 24 and 48 hours of cooling. At the end of the experiments the hogs were sold to a packing house in Fort Worth, Tex., subject to a killing test. They were followed through the packing plant to the cooler and examined and checked by the author and an expert cooler man after being held in the coolers for 24 hours at from 32 to 38°. The results of this examination are given in the above table.

In addition to the slaughter test, melting point determinations were made by the station chemist of samples of fat taken from the leaf fat, shoulder, and along the back of three hogs of each lot. The results of these determinations are charted. It is noted that the back and shoulder fats had a much lower melting point than the leaf fat. The hogs fed peanuts throughout the period, and killing soft, showed a much lower melting point than those receiving a straight grain ration throughout, and also showed a lower melting point than those fed grain for 30 to 60 days after grazing on peanuts 40 days. In practically every case the melting point test corroborated the test in the coolers. The hogs were valued at the beginning of the test at 7.5 cts. per pound. They sold for 10.9 cts. on the Fort Worth market, the soft or oily hogs being docked 1.5 cts. per pound. In spite of high prices for feed and labor a profit was made on every lot but lot 1.

[Cost of wintering brood sows], M. F. GRIMES (*Delaware Sta. Rpt. 1917, pp. 17, 18*).—Five lots of Berkshire sows were fed from November 21, 1916, to January 30, 1917. The sows were bred shortly before the experiment began. The rations consisted of alfalfa hay and corn on the ear for lot 1, cut alfalfa

hay and hominy meal for lot 2, corn silage, corn, and middlings for lot 3, and corn and middlings for lot 4. The weights of all the sows were practically the same at the end as at the beginning of the test. It is noted that the consumption of 549 lbs. of cut alfalfa by lot 2 and 550 lbs. of silage by lot 3, reduced the amount of grain needed for maintenance by nearly 25 per cent as compared with lots 1 and 4 where the sows ate little else than grain.

[Inbreeding experiments with pigs], H. HAYWARD (*Delaware Sta. Rpt. 1917, p. 17*).—A brief progress report is made of inbreeding experiments being carried on with pigs at the station. By double mating the inbred Berkshire sows with an inbred Berkshire boar and a pure-bred Chester White boar a number of litters have been obtained containing pigs by each sire. In these cases the white pigs have been a check upon their black inbred litter mates. "In growing out these litters the greatest difference has been noted in the superior size, growth, and vigor of the crossbreds compared with the pure-bred pigs."

The agricultural situation for 1918.—**XI, Poultry.**—One hundred hens on every farm—one hundred eggs from every hen (*U. S. Dept. Agr., Office Sec. Circ. 107 (1918), pp. 24*).—The plea is made for a large increase in the production and utilization of poultry and eggs in the present crisis, especially for an increased production on the general farm where poultry subsists largely on waste grain and other waste products. A standard of 100 hens on every farm in the United States is urged, and hints are given on the breeding and management of hens for the minimum egg production of 100 eggs per hen annually. Notes on the care and management of ducks, geese, turkeys, guineas, and pigeons are included, and suggestions are outlined for the keeping of hens in back yards in cities and towns.

New Jersey's poultry program for 1918, H. R. LEWIS (*New Jersey Stas. Hints to Poultrymen, 6 (1918), No. 7, pp. 4*).—An outline of plans being followed for the stimulation of poultry production in New Jersey.

Egg-producing values of some Texas feeding stuffs, R. N. HARVEY (*Texas Sta. Bul. 220 (1917), pp. 5-11, figs. 2*).—The object of the experiment here reported was to determine whether or not rations composed entirely of vegetable feed can be fed as profitably as rations consisting in part of meat feeds, and also to determine the relative feeding values of skim milk, cottonseed meal, meat scrap, and peanut meal for laying hens. The test lasted 24 weeks from December 20, 1916. The hens used were standard-bred White Leghorns of a good strain and were fed in yards. The rations consisted of milo maize, bran, and shorts, and a protein supplement. This supplement was skim milk for lot 1, cottonseed meal for lot 2, meat scrap for lot 3, and peanut meal for lot 4, the amounts being calculated to furnish equal quantities of protein, with the meat scrap ration as a basis.

The average egg production per hen during the 24 weeks was 89.95 for lot 1, 59.95 for lot 2, 75.31 for lot 3, and 56.8 for lot 4. The cost of producing a dozen eggs for the respective lots was 16.6, 19.9, 17.2, and 20.5 cts. The number of pounds of feed required to produce a dozen eggs was 9.41 for the skim milk pen, 5.75 for the cottonseed meal pen, 4.86 for the meat scrap pen, and 5.8 lbs. for the peanut meal pen.

It is noted that the pens which cost the most in feed per hen gave the greatest returns per hen. The hens receiving some animal feed were more profitable than those receiving vegetable feed only. Vegetable feeds with high protein content seemed unable to replace animal feeds in the ration. The fowls preferred the ration containing animal feed and ate it in larger quantities. Sour skim milk appears to be more profitable than meat scrap as a source of protein, when it can be obtained at a reasonable cost.

On the differential effect of certain calcium salts upon the rate of growth of the two sexes of the domestic fowl, R. PEARL (*Science*, n. ser., 44 (1916), No. 1141, pp. 687, 688; *abs. in Maine Sta. Bul.* 268 (1917), p. 304).—Daily doses of from 0.1 gm. to 0.3 gm. of calcium lactate and calcium lacto-phosphate, respectively, were fed to chicks, beginning when the chicks were 29 days of age and continuing until they were 107 days old. Neither of these calcium salts affected the rate and amount of growth in the male chicks, but at the end of the 142-day period the females were so much larger than the control females that there had been eliminated 58.4 per cent of the normal difference in body weight between the sexes. The reproductive organs of the females were also stimulated, the rate of egg production in the lacto-phosphate females being nearly five times as great as in the controls.

A very small amount of corpus luteum substance administered daily along with the calcium lacto-phosphate completely inhibited the stimulating effect of the latter.

Sex studies.—VIII, The sex ratio in the domestic fowl, R. PEARL (*Proc. Amer. Phil. Soc.*, 56 (1917), No. 5, pp. 416-436, figs. 3; *abs. in Maine Sta. Bul.* 268 (1917), p. 309).—In this paper statistical data are presented and analyzed regarding the normal sex ratio in the domestic fowl. The statistics cover eight years and represent over 22,000 chicks.

Of 20,037 chicks examined in families or single matings of 10 or more offspring, 48.57 per cent were males. The excess of females was fairly regular during the eight years covered by the study. The ratio in individual families is shown to be approximately symmetrical about the mean, with high contact at both ends. These fitted curves indicate that in every 1,000 families of 20 birds 1 is expected containing 20 pullets.

During 1916 and 1917, 927 of the 1,921 dead embryos examined were males and 994 females. The conclusion is reached that prenatal mortality is not differential in respect to sex, and that in consequence the observed sex ratio at birth is subsequently the same as the initial zygotic sex ratio.

Sex studies.—IX, Interstitial cells in the reproductive organs of the chicken, ALICE M. BORING and R. PEARL (*Anat. Rec.*, 13 (1917), No. 5, pp. 253-268, figs. 6; *abs. in Maine Sta. Bul.* 268 (1917), p. 308).—Further facts are presented, together with a review of literature, regarding the nature and distribution of interstitial cells (*E. S. R.*, 27, p. 869; 34, p. 264).

True, secreting interstitial cells were found in abundance in all mature ovaries examined. No such cells were differentiated in the newly hatched female chicks or guineas examined. These cells are cytologically identical in the fowl and in the cow. Examination of testicular material from 64 male fowls ranging in age from newly hatched to 18 months showed the presence of interstitial cells in the testes of the 4 newly hatched birds, but not in any of the 60 mature birds. The authors conclude that the facts regarding the occurrence and distribution of interstitial cells are such as to make it very difficult to suppose that they have any causal effect upon secondary sex characters.

The experimental modification of germ cells, R. PEARL (*Jour. Expt. Zool.*, 22 (1917), Nos. 1, pp. 125-186, figs. 7; 2, pp. 241-310, figs. 7; *abs. in Maine Sta. Bul.* 268 (1917), pp. 297-303).—The following papers are reported in a series of studies of attempts to modify hereditary factors or determinants and to note the hereditary behavior following such modifications.

I. General plan of experiments with ethyl alcohol and certain related substances (pp. 125-164).—In this series of investigations the problems specifically dealt with were the precise and specific changes in the germinal material, if any, caused by the continued administration of ethyl alcohol or similar narcotic poisons to the domestic fowl. A study was also made of the effects upon the soma of the treated in-

dividual of the continued administration of such poisons to give a clue as to the probable origin or mechanism of germinal changes. The fowls used in the experiments were Black Hamburg males and Barred Plymouth Rock females and their F_1 offspring. Each treated bird had from one to five or six untreated full sisters to serve as controls. Both strains had been used by the author in a variety of Mendelian experiments, and their genetic behavior was well known. Complete data are given as to the breeding of the foundation animals used in this study, covering a period of four years before the beginning of the experiments. The amount and intensity of inbreeding in the parents of the experimental birds was low.

Attempts were made to modify the germ cells by treating the fowls with ethyl alcohol, methyl alcohol, or ether. The poisons were administered by inhalation. To determine the time during which the parents were subjected to treatment with the alcohol prior to the birth of the offspring, a measure designated as the "total germ dosage index" is proposed. This is defined as the total number of days during which the two gametes making the offspring zygote were exposed to alcoholic influence while sojourning in the bodies of the treated individuals. The treatment of the F_1 generation ranged from 130 to 354 days, with a mean of 210.35 days.

A bibliography of 43 titles is listed.

II. *The effect upon the domestic fowl of the daily inhalation of ethyl alcohol and certain related substances* (pp. 165-186).—In describing the effects of alcohol and related substances on the germs of fowls, attention is first given to the physiological and structural effects on the treated fowls. During the first 15 months of the experiments the only ones of the treated birds which had died were seven which were killed by an overdose of the reagents, while the mortality of the control birds was 41 per cent. This high mortality of the control birds was largely due to an epidemic of diphtheritic roup, and although the poisoned birds were exposed in every way just as were the controls none of them contracted the disease. No male birds died. Immediately following the beginning of treatment in the autumn there was an increase in body weight of treated birds, which is thought to be not due to the treatment. From January and February to May and June there was a sharp and prolonged fall in body weight which was followed by a steady increase. On February 1, 1916, the treated birds averaged 9.9 per cent heavier than the controls. The egg production of the treated birds and the controls was normal, both in seasonal distribution and in amount. The mean production per bird during the 15 months was for the untreated flock 184.74 eggs and for the treated hens 183.97 eggs.

III. *The effect of parental alcoholism and certain other drug intoxications upon the progeny* (pp. 241-310).—In this paper are discussed the observable effects of the alcoholization of one or both of the parents upon the F_1 progeny. It was found that the fertility of the eggs where one or both individuals were treated was reduced in direct proportion to the dosage of poison. Both prenatal (dead embryos) and postnatal mortality was materially smaller where one or both parents were treated than in the controls. There was no relation between the calculated reproductive capacity of the alcoholized birds and the total dosage to which their gametes were subjected during the breeding season of 1915. The sex ratio of the progeny was not significantly affected by the treatment of parents. There was no material difference in mean hatching weight between the offspring of treated males and those of control males when both were mated to normal untreated females. Both the male and the female offspring of matings in which both parents were treated were materially heavier when hatched than the offspring of either the completely normal control mat-

ings or of matings in which the father only was treated. The adult offspring of alcoholized parents (one or both) were heavier than the controls. No difference in rate of growth was noted in the offspring until the males were 100 days old and the females 150 days old. The normal Mendelian inheritance in the F_1 , in so far as the phenomena of dominance, recessiveness, and sex linkage were concerned, was not affected by the treatment of parents.

These experiments apparently furnish no evidence that specific germinal changes have been induced by the alcoholic treatment, at least in those germ cells which produced zygotes; nor is any evidence found that the germ cells which formed zygotes were in any way injured or adversely affected. These results are accounted for on the hypothesis that alcohol and similar substances act as selective agents upon the germ cells of treated animals. The essential points in this hypothesis are explained.

The probable error of a difference and the selection problem, R. PEARL (*Genetics*, 2 (1917), No. 1, pp. 78-81; *abs. in Maine Sta. Bul.* 268 (1917), p. 303).—This paper questions the arithmetical calculation of the probable error of a difference used by J. E. Ackert¹ in interpreting selection experiments with *Paramecium*. Ackert's results as corrected by the author are briefly discussed.

A note on the fitting of parabolas, J. R. MINER (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 2, pp. 91-95; *abs. in Maine Sta. Bul.* 268 (1917), p. 304).—This paper gives formulas and tables for the fitting of parabolas by the method of moments, taking origin one unit below the first ordinate.

DAIRY FARMING—DAIRYING.

The four essential factors in the production of milk of low bacterial content, S. H. AYERS, L. B. COOK, and P. W. CLEMMER (*U. S. Dept. Agr. Bul.* 642 (1918), pp. 61, pls. 6, figs. 23).—These experiments on the production of milk practically free from visible dirt and of low bacterial count were performed in a small experimental barn at the Dairy Division farm at Beltsville, Md. The building provided space for four cows and was of wooden construction throughout, including floor, gutters, and mangers. The term "production of milk," as used in the bulletin, covers only the period from the time the milk leaves the cow until it is in the delivery cans or bottles.

Beginning with conditions in which the barns and cows were as filthy as possible, certain factors causing contamination of milk were eliminated gradually until milk of the desired quality was produced. The conditions were then duplicated in order to determine again the value of the essential factors. In the first experiments, which lasted from July 22 to August 14, 1915, the manure was removed from the barn once a week, and as a result varying quantities of filth were present on the floor and on the cows. Two of the cows were milked into open and the other two into small-top pails which were washed clean and unsterilized. The milk was then poured into clean, unsterilized cans in the barn, after which it was carried to the milk house, where samples were taken immediately both night and morning and examined before cooling. The average bacterial count of 32 samples from the open pails was 497,653 per cubic centimeter, and from the small-top pails 368,214. The relatively low bacterial count of milk produced under such filthy conditions is deemed interesting and indicates that large numbers of bacteria are not commonly found in fresh milk.

The next test, which lasted from September 14 to October 7, 1915, was a duplicate of the first, except that sterilized cans and bottles were used. The average count of 36 samples of milk from the open pails was 22,677 bacteria per cubic centimeter, and from the small-top pails 17,027. In 29 of the 36 samples

¹ *Genetics*, 1 (1916), pp. 387-405.

the bacterial count from the open pails was higher than that from the small-top pails.

In the third test the cows and floor were dirty, the manure was removed twice a week, the udders and teats of the cows were washed, and sterilized utensils were used. During the period of this test, November 10 to 24, 1915, the average bacterial count of 18 samples from open milk pails was 6,166 and of 23 samples from small-top pails, 2,886. Of 12 samples of milk drawn directly from the udder into sterile tubes at about the middle of the milking period, the average count was 987 bacteria per cubic centimeter.

In the fourth experiment the cows were cleaned daily with currycomb and brush and bedded, the floors were kept clean, the manure was removed daily, the udders and teats of two cows were washed and of two others not washed, and the utensils were sterilized. Small-top pails were used throughout this experiment, which lasted from February 28 to April 10, 1916. Of 65 samples the average count from washed udders and teats was 2,154 bacteria per cubic centimeter and from unwashed udders and teats 4,524. Bacteriological examinations by the milk tube method of samples of the fresh milk produced under the conditions of this test and of samples of the middle milk as drawn from the udder indicate that milk of a high quality from a bacteriological standpoint was being produced.

In duplicating the conditions in the above experiments, the fifth experiment was performed under conditions similar to those in experiment 2. Of 41 samples of milk examined from both small-top and open pails, from April 11 to May 6, 1916, the average bacterial count from the small-top pails was 24,439 and from the open pails 86,212 per cubic centimeter.

Experiment No. 6, lasting from May 8 to 31, 1916, was conducted under conditions similar to those in No. 1. The average bacterial count of 36 samples of milk from the small-top pails was 114,497, and from the open pails, 153,905 per cubic centimeter.

Experiment No. 7 was conducted under the same conditions as No. 4, except that the cows were not bedded. The floor of the stable was kept comparatively clean, the manure was removed daily, the utensils were sterilized, and at each milking the cows were cleaned and the udders and teats were wiped with a damp cloth. Of the 15 sets of samples examined in this test from June 5 to 15, 1916, the average number of bacteria per cubic centimeter was 4,947 from open pails, and 2,667 from small-top pails.

In order to obtain additional information on the effect of the use of unsterilized utensils an examination was made of 60 samples of milk from both sterilized and unsterilized small-top pails. Each set represented two samples taken at the same milking, when two cows were milked into a sterilized pail and two into an unsterilized pail. The average count from the sterilized pail was 6,306 per cubic centimeter, as compared with 73,308 from the unsterilized pail. Another series of samples of milk drawn from dirty cows when the manure was removed only twice a week showed an average bacterial content of 31,040 per cubic centimeter from sterilized utensils and 666,520 per cubic centimeter from unsterilized utensils. In this comparison an examination was made of milk under the same barn conditions, but with utensils treated in a different manner. After milking, the milk was poured from the utensils, but the drainings were allowed to remain. The utensils were then placed upright on the floor until the next milking, when they were washed in the same manner as in previous experiments. The average bacterial count of samples taken under these conditions was 1,667,000 bacteria per cubic centimeter.

Results are given of determinations of bacteria obtained in different rinsings of cans and bottles and in sterilized cans which were covered before being

dried. These show the possibility of great contamination from unsterilized utensils and from sterilized utensils not properly dried. Sediment tests made of unstrained milk show in almost every instance less sediment from the use of small-top pails than from open pails. When fresh, unstrained milk, handled in sterilized utensils was examined a fairly constant relation was found to exist between the quantity of sediment and the bacterial content. This relation was found to be influenced by the variable number of bacteria in manure. The number of bacteria per gram in 57 samples of fresh cow manure varied from 2,900,000 to 690,000,000, with an average of 49,645,614. On the basis of this average, 0.5 gm. of fresh manure per pint of milk would add to the milk about 53,000 bacteria per cubic centimeter, while 0.01 gm. of manure per pint would add 1,057 bacteria per cubic centimeter. These figures confirm previous conclusions that manure is not as great a factor as unsterilized utensils in the contamination of milk by bacteria.

The results of these experiments indicate that the three essential factors of most influence in the production of milk of low bacterial content are, in the order named, the use of sterilized utensils, clean cows, and small-top milk pails. The practical value of these three essential factors was tested on six farms in the vicinity of Grove City, Pa. These six farms scored according to the dairy-farm score card of the Dairy Division 44.1, 42, 40.5, 41.1, 40.9, and 38.4, respectively, out of a possible 100. The average bacterial count of 93 samples of milk taken from the five farms under ordinary conditions was 87,391 per cubic centimeter, which was reduced to 4,602 after the introduction of the three essential factors.

In order to obtain further information on the bacterial content of fresh milk as produced under ordinary farm conditions, 249 samples of fresh, strained, uncooled milk from 12 farms around Grove City, Pa., were examined during the summer of 1916. The night samples averaged 115,135, and the morning samples, 180,696 bacteria per cubic centimeter, the general average being 135,146.

A study was next made of the effect of holding milk at different temperatures for varying lengths of time. Samples of milk were held at 40, 50, and 60° F., and examined when fresh and after intervals of 24 hours for 96 hours. The milk was produced in the experimental barn under three different sets of conditions, as follows: (1) Cows were clean and bedded; the udders washed part of the time and left unwashed part of the time; the small-top pail used; and all utensils were sterilized. (2) Cows were dirty; the manure was removed twice a week; both open and small-top pails used; and all utensils were sterilized. (3) Conditions same as second, except that the utensils were not sterilized.

The following table shows the average number of bacteria per cubic centimeter in a large number of samples of milk produced and held under the conditions mentioned:

Bacteria per cubic centimeter in milk held at different temperatures.

Conditions.	Temperature.	Age of milk.				
		Fresh.	24 hours.	48 hours.	72 hours.	96 hours.
	° F.					
Cows clean, utensils sterilized.....	40	4,295	4,138	4,566	8,427	19,696
Cows dirty, utensils sterilized.....	40	39,082	88,028	121,864	186,245	1,086,922
Cows dirty, utensils not sterilized..	40	136,533	281,646	538,775	749,030	852,835
Cows clean, utensils sterilized.....	50	4,295	13,961	127,727	5,725,277	39,490,826
Cows dirty, utensils sterilized.....	50	39,082	177,437	831,615	1,761,458	13,079,166
Cows dirty, utensils not sterilized..	50	136,533	1,170,546	13,662,115	25,687,541	41,207,272
Cows clean, utensils sterilized.....	60	4,295	1,587,333	33,011,111	326,500,000	962,788,714
Cows dirty, utensils sterilized.....	60	39,082	4,461,111	99,120,000	633,375,000	1,355,650,000
Cows dirty, utensils not sterilized..	60	136,533	24,673,571	639,884,615	2,407,083,333	5,346,666,666

The market milk business of Detroit, Mich., in 1915, C. E. CLEMENT and G. P. WARBER (*U. S. Dept. Agr. Bul. 639 (1918), pp. 28, pls. 3, figs. 13*).—A study is reported of the market milk business as conducted in Detroit, Mich., during the year 1915, with the view of explaining some of the market conditions and milk marketing practices in the larger American cities.

The pasteurization of market milk had been made compulsory by ordinance in Detroit three months before the investigations were begun, so that a special study was also made of the effects of compulsory pasteurization upon the number of dealers engaged in the business and upon the methods of handling and distributing milk.

The cost of delivering milk for 28 dealers, including items of administration, office expenses, taxes, and other miscellaneous expenses was on the average 2.45 cts. per quart.

Among the conclusions it is noted that "a lack of standardization in the construction and equipment of country milk stations contributed largely to the varying costs of handling milk in the country. . . . The variation in costs of preparing milk for city distribution was caused primarily by a lack of standardization in plant construction and equipment, and by the fact that some plants were not run efficiently or at full capacity. The low cost of delivering milk in wholesale quantities to retail stores suggests possible economies by dealers if such a system of distribution were practiced by all. The cost of handling and distributing in the city does not vary directly in proportion to the number of gallons handled, although the larger dealers do effect certain economies not possible to the smaller ones."

Feeding the dairy calf, A. B. NYSTROM (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 1, pp. 5-8*).—Brief directions are given for raising dairy calves, especially under conditions where whole and skim milk are largely unavailable.

Sunflower silage for dairy cows.—A preliminary report, C. N. ARNETT and O. TRETSVEN (*Montana Sta. Bul. 118 (1917), pp. 73-80*).—Two lots of 7 cows each were fed for two 28-day periods by the reversal method a ration of grain (oats, malt sprouts, and bran, 5:2:3) and choice alsike clover hay. In addition, one of the lots was fed Giant Russian sunflower silage. During the 28 days the 14 cows on grain and hay gained an average of 11 lbs. in weight, and produced an average of 33.37 lbs. of milk and 1.882 lbs. of fat per head daily. During the 28 days on grain, hay, and sunflower silage the cows gained an average of 6 lbs. and produced an average of 34.35 lbs. of milk and 1.459 lbs. of fat per head daily. They ate an average of 34 lbs. of sunflower silage per head daily, which effected a saving of 9 lbs. of clover hay. No objectionable flavors or change in the milk due to the silage could be detected.

Breeding milking Shorthorns, E. W. SHEETS (*West Virginia Sta. Rpt. 1915-16, pp. 28, 29*).—A short progress report is made of an experiment on cost of milk production with milking strains of the Shorthorn breed, and the cost of producing beef with their offspring. The average feed cost of production for seven cows during one to four lactation periods was 32.8 cts. per pound for milk fat and \$1.33 per hundredweight for milk. In obtaining these cost data all grains were charged at \$30, alfalfa hay at \$20, and corn silage at \$4 per ton and pasture at \$2 per month.

Testing milk and cream for butter fat, R. E. CALDWELL, T. H. BROUGHTON, and S. L. ANDERSON (*Indiana Sta. Circ. 78 (1918), pp. 15, figs. 22*).—Directions are given for the use of the Babcock test in testing milk, cream, skim milk, buttermilk, and whey for milk fat.

Marketing butter and cheese by parcel post, L. B. FLOHR and R. C. POTTS (*U. S. Dept. Agr., Farmers' Bul. 930 (1918), pp. 12, figs. 6*).—Experimental

shipments of more than 2,000 lbs. of butter in 2, 3, 5, and 10 lb. parcels were made from four creameries to the Bureau of Markets of this Department to test the possibilities of parcel-post shipping of butter. Of 222 shipments from April to October from a creamery 375 miles from Washington, 218 were received in satisfactory condition. During July and August only one package out of 61 shipments was received in an unsatisfactory condition from a creamery 536 miles from Washington. In June and July 73 out of 82 shipments from a creamery 187 miles from Washington arrived in good condition. The fourth creamery, located 206 miles from Washington, shipped 89 packages from April to January, and all arrived in satisfactory condition. These satisfactory results are attributed to the care exercised in the proper packing of the butter in suitable shipping containers and the thorough precooling of the butter at the creameries before shipment.

Shipments of the butter received from the creameries were made to experimental stations, and return shipments were made of the same. These were satisfactory when the temperature was not too high or the distance too great. The results of these experimental shipments indicate that well-made butter, thoroughly chilled before shipping, when packed in a suitable container, may be marketed satisfactorily by parcel post when extreme high temperatures are not encountered. Even though proper safeguards were taken, the shipments made during extremely hot weather frequently arrived in an oily and unsatisfactory condition.

Brief directions are given for the marketing of butter and cheese by parcel post.

Conserving sugar in ice cream manufacture, H. A. RUEHE (*Illinois Sta. Circ. 219 (1918), folio*).—Methods for the conservation of sugar in ice cream manufacture by the use of invert sugar sirup, corn sirup, or glucose are suggested. Directions are given for making invert sugar sirup.

VETERINARY MEDICINE.

Department of veterinary science and bacteriology (*Nevada Sta. Rpt. 1917, pp. 44-56*).—A potent antianthrax serum has been prepared. It is pointed out that the serum-vaccine method has the advantage over the double vaccination method of Pasteur of conferring immediate immunity with but one handling of the cattle.

The results of chicken cholera studies have been previously noted (E. S. R., 37, p. 183). The work on equine anemia has been suspended for lack of material. The serum treatment of hemorrhagic septicemia has been noted from other sources (E. S. R., 38, p. 784). The theory is advanced that drainage of wet pastures may ultimately solve the problem of the control of the disease. Until this can be accomplished seasonable vaccination and the prompt treatment of cases with antihemorrhagic septicemia serum will reduce losses to a minimum.

Experiments on hog-cholera serum purification by chemical precipitation have shown that both the euglobulin and pseudoglobulin fractions are potent so that the entire globulin content must be used. Eight lots of serum have been processed and tested upon pigs by the simultaneous use of the globulins and hog-cholera virus, the results showing that the globulins apparently protect hogs against inoculation as successfully as does raw serum. Considerable difficulty, however, has been encountered in the filtration of the globulin solutions. Preliminary experimental work has shown that a similar method can be used to refine and concentrate antianthrax serum. It is probable, however, that of the

various antisera to which this method of separation of the active principle may prove applicable each may require a somewhat different treatment.

Further study of contagious epithelioma in chickens (E. S. R., 35, p. 555) has given additional evidence that it is a group of infections rather than a single infectious disease. Studies on "scab virus" are being conducted to determine its filterability, thermal death point, effect of prolonged maceration in glycerin, specific serum reaction, and the possibility of growth inside the bodies of chickens.

Plant poisons (*Nevada Sta. Rpt. 1917, pp. 58-61*).—Work with death camas (*Zygadenus intermedium*) shows it to be poisonous at all stages of its growth. The leaves are poisonous prior to blooming and at the blooming period all parts of the death camas are poisonous, the flower cluster being the most poisonous per unit weight of material, the tubers next, and then the leaves, while the stems are the least poisonous. After the plant has reached the seeding stage the seeds are the most poisonous. The tubers appear to be poisonous at all times but due to being from 4 to 6 in. below the surface of the ground they play no direct part in the poisoning of range animals.

Physiological tests made of extracts from the blue lupine (*Lupinus* sp.) leaves and flowers prior to seeding stage have shown them to be nontoxic to rabbits. In work with a species of goldenrod (*Solidago spectabilis*), which had been found to cause the death of a number of sheep the season before, it was found that the poisonous principle in the leaves is either potash or iron, or both.

A new poisonous plant, the poison alkali brush (*Tetradymia glabrata*), was discovered during the year after having caused the poisoning of 1,100 sheep belonging to a single sheepman. Analyses of the tips of the brush showed the presence of 25.9 per cent soluble potash in the ash, equivalent to 2 per cent chlorid of potassium in the green twigs.

Report of research chemist, O. A. BEATH (*Wyoming Sta. Rpt. 1917, pp. 146-149*).—A brief report of work with poisonous plants.

Lupinus argenteus, regarded as the most poisonous of the native lupines, was submitted to an alkaloidal assay with the following results: Early pods, 0.4695 per cent; late seeds, 0.3346 per cent; early leaves, 0.3196 per cent; late pods, 0.2687 per cent; flowers, 0.232 per cent; early seeds, 0.1178 per cent. Crude alkaloids were computed as lupinin.

The finely powdered plants were exhausted with alcohol and the crude poisons after one purification were given to rabbits intravenously. In order of toxicity the following results were obtained: Early pods, lethal dose, 17 mg. per kilogram weight; early leaves, lethal dose, 17 mg.; flowers, lethal dose, 21 mg.; late seeds, lethal dose, 28 mg.; early seeds, lethal dose, 32 mg.; and late pods, very slightly toxic. While it has been reported that lupine alkaloids are easily soluble in water, repeated experiments were made with aqueous extracts with negative results as to toxicity.

A small quantity of poison was isolated from the woody aster for the first time.

A handbook on antiseptics, H. D. DAKIN and E. K. DUNHAM (*New York: The Macmillan Co., 1917, pp. IX+129, pls. 2, figs. 2*).—This is a small handbook prepared with a view to giving a concise account of the chief chemical antiseptics which have been found useful for surgical purposes during the present war.

Following a general introduction the subject is dealt with under the headings of antiseptics of the chlorin group, the phenolic group, salts of the heavy metals, dyes, and miscellaneous antiseptics, methods of testing antiseptics, and certain special applications of antiseptics.

Some common disinfectants, M. DORSET (*U. S. Dept. Agr., Farmers' Bul.* 936 (1918), pp. 12).—A revision of Farmers' Bulletin 345 (E. S. R., 20, p. 884).

Dakin's dichloramin-T solution for ocular infections, A. S. and L. D. GREEN (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 17, pp. 1212, 1213).—The authors report the successful use of dichloramin T as a conjunctival antiseptic. It is used in solutions of from 0.5 to 1 per cent strength, instillations of 4 or 5 drops being made at hour intervals. Cases are described showing satisfactory results obtained in hospital practice.

The action of antiseptics on the toxin of *Bacillus welchii*.—A preliminary note, H. D. TAYLOR and J. H. AUSTIN (*Jour. Expt. Med.*, 27 (1918), No. 3, pp. 375-381; *abs. in Chem. Abs.*, 12 (1918), No. 9, p. 923).—The action of various antiseptics on the toxin of *B. welchii* as prepared by Bull and Pritchett (E. S. R., 37, p. 781) was studied, using pigeons as indicators.

The results show that Dakin's hypochlorite and chloramin-T solutions will protect pigeons against multiple fatal doses of the toxin of *B. welchii* when the antiseptic and the toxin are mixed in vitro and allowed to stand in contact for five minutes before injection. The detoxicating action of the solutions is demonstrable also in the presence of serum. Phenol solution, 0.25 per cent, has no such action.

The explanation of the difference in behavior of the two classes of antiseptics is that the one represented by phenol possesses little or no destructive action upon the products of bacterial activity, while the chlorinated antiseptics attack chemically not only the bacteria, but also their products and, by an alteration or disintegration of the molecules of the latter, render them inert.

Local reactions in the treatment of epizootic and ulcerous lymphangitis by pyrotherapy, BELIN (*Bul. Soc. Cent. Méd. Vét.*, 94 (1918), No. 2-4, pp. 72-79).—The author discusses the preparation of antiepzootic and antiulcerous pyrovaccines by his method previously noted (E. S. R., 38, p. 587) and that of Velu (E. S. R., 38, p. 587), and claims the superiority of his own method of using nondiluted ether as destroying more completely the microorganisms in the pus and thus preventing local reactions. The use of the vaccine is suggested as a preventive as well as curative measure.

It is recommended that wounds which are in the least contaminated should be treated by a subcutaneous injection of 2 cc. of each vaccine, and in the case of a second wound in another part of the body an injection of 2 cc. of the antiepzootic vaccine alone. If the wounds have not healed at the end of a week a second injection is recommended.

The chemotherapy of experimental pneumococcus infection, J. A. KOLMER and E. STEINFELD (*Jour. Infect. Diseases*, 22 (1918), No. 5, pp. 492-501).—The authors report investigations in the chemotherapy and the chemoserotherapy of experimental pneumococcus invasions.

The ordinary soluble salts of mercury and numerous new mercurial compounds were found to be without appreciable effect in prolonging the lives of mice infected with a dose of Type I pneumococcus culture lethal within 72 hours. Derivatives of quinin seem to be at present the most efficacious pneumococidal agents. Subcutaneous injection of ethylhydrocuprein hydrochlorid in doses without protective value usually increases the protective value of anti-pneumococcus serum to a slight extent. Several of the more common compounds of quinin, as quinin and urea hydrochlorid and quinin bromid, act in a similar way but less regularly and to a lesser extent. Mercurial compounds seem to have no effect on the protective power of the serum in severe experimental infections.

A study of an autoagglutinin occurring in a human serum, MILDRED C. CLOUGH and INA M. RICHTER (*Bul. Johns Hopkins Hosp.*, 29 (1918), No. 326, pp. 86-93, pl. 1; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 18, p. 1333).—The autoagglutination observed occurred only at low temperatures (below 22° C.) and broke up at body temperature but could be reproduced by again chilling the same preparation. The autoagglutinin resisted heating to 60° for $\frac{1}{2}$ hour but was destroyed at 65°. It remained active in the ice box for several months. It was nondialyzable, not removed by extraction with chloroform, precipitated with the euglobulin by saturated ammonium sulphate solution, and absorbed from the serum during the process of agglutination at low temperatures. It was active on red blood cells from all the different species of animals with which it was tested (man, rabbit, guinea pig, hen, sheep, cat, and pig).

A comparison of rouleaux formation with autoagglutination showed that the former occurs equally well at high or low temperatures, but only in concentrated serum. The activity of the rouleaux-forming substance rapidly disappears on standing.

The authors consider that the presence of the autoagglutinin in the case studied was probably not a pathological phenomenon but an individual hereditary peculiarity.

A case of enteritis in man caused by the bacillus of fowl cholera, V. W. BOER (*Centbl. Bakt. [etc.], 1. Abt., Orig.*, 79 (1917), p. 390; *abs. in Rev. Bact.*, 7 (1917), No. 4, p. 102).—A bacillus pathogenic for the rabbit and for birds and having all the morphological and cultural characteristics of *Bacillus avi-septicus* was isolated from the feces of a case of enteritis which clinically resembled Asiatic cholera. The patient's serum gave specific agglutination and complement-fixation reactions with the bacillus.

A comparative study of infantile paralysis, animal distemper, and its related diseases, L. D. BRISTOL (*Jour. Med. Research*, 37 (1918), No. 3, pp. 391-426).—In part 1 of this work the author attempts to show that there are certain rather suggestive epidemiological, pathological, and clinical characteristics common to distemper (and its related diseases of lower animals) and human infantile paralysis. In part 2 he endeavors to show by bacteriological and serological experiments that possibly the above analogies may be extended to include biological similarities in the infecting organisms concerned. The studies led him to suggest the possibilities that the organism of poliomyelitis is a pleomorphic bacillus (often indistinguishable from a true coccus) and that it may be closely related to the large group of so-called bipolar bacilli, or Pasteurella of Ligniers. It appears that all of these organisms, including that of poliomyelitis, have the power to adapt themselves somewhat to variable degrees of oxygen tension.

"The chief theoretical suggestion is that infantile paralysis may be nothing more than the manifestation of a common widespread human pasteurellosis—the nonparalytic (a better term than 'abortive') cases representing chiefly the digestive and respiratory types of the disease, while the paralytic cases may be included in the nervous type. Based on this assumption, the mode of spread may be considered analogous to that demonstrated for all forms of pasteurellosis in animals, namely, (1) directly, by contact with the fresh secretions or excretions of an infected individual (either diseased or a healthy 'carrier'); (2) indirectly, by the carriage of the specific organisms by insects, or possibly in dust, uncooked food, or drink.

"Considering the epidemiology of the disease in this light, the great variation in virulence which is characteristic of the various bipolar bacilli must be kept in mind. Thus, bipolar bacilli causing disease in one animal are most virulent

for that particular species of animal, but (though somewhat less virulent) this same strain of organism may at times cause symptoms of similar disease in other species. Hence, we might believe that sporadic cases, small outbreaks, or local 'outcroppings' in epidemics of a human pasteurellosis have their origin in lower animal 'reservoirs'; but that severe, widespread epidemics, and the gradually increasing prevalence of the disease, are due more to the passage of a human strain of the organisms (of a steadily increasing virulence) directly or indirectly from person to person."

A list of 47 references to the literature is included.

Tuberculosis and blastomycosis, F. SANFELICE (*Ann. Ig. [Rome]*, 28 (1918), No. 2, pp. 49-56).—An examination is reported of the blastomycetes which are frequently found in the lungs of tuberculous cattle. No pathogenic oidia were detected, but blastomycetes were found identical in morphological and cultural characteristics with *Saccharomyces neoformans*. This species, isolated from the lungs of tuberculous cattle, when inoculated from a pure culture into rabbits, guinea pigs, and white mice, is capable of causing death with diffuse infection. Inoculated simultaneously with human or bovine tubercle bacilli, death is also caused with pathoanatomical findings of tuberculosis and diffuse blastomycosis. There is a similar connection between the bacilli of avian tuberculosis and *S. neoformans*.

Hairlessness and goiter in newborn domestic animals, H. WELCH (*Montana Sta. Bul.* 119 (1917), pp. 81-104, figs. 9).—Occasional losses in Montana of young pigs born without hair, extending over a period of some 15 or 20 years, led to the investigations here reported.

The results show that a disturbance of the function of the thyroid gland is the immediate cause of hairlessness in pigs, lambs, and calves, and of weakness in colts. The occurrence of hairlessness in pigs appears to be independent of any system of feed, care, or management as yet practiced, and is not due to infectious abortion. The enlarged thyroid glands were found to be very deficient in iodine, which has been demonstrated to be the essential element for the proper functioning of the gland and when supplied to the female breeding stock during gestation is apparently effective as a preventive of goiter in the newborn. The author feels justified in advocating the feeding of iodine (potassium iodide) to pregnant domestic animals in sections of the Northwest where goiter is prevalent. It is stated that this affection has been known for a number of years in sections of several Northwestern States, including Washington, Idaho, North Dakota, South Dakota, Minnesota, and Montana.

Thyroid hyperplasia and the relation of iodine to the hairless pig malady, I. E. B. HART and H. STEENBOCK (*Jour. Biol. Chem.*, 33 (1918), No. 2, pp. 313-323, pls. 2; *abs. in Chem. Abs.*, 12 (1918), No. 8, pp. 827, 828).—The authors support the view of Smith (*E. S. R.*, 37, p. 278) that the hairless pig malady is occasioned by low iodine assimilation which results in a goitrous condition in both mother and young and interferes more severely with fetal development than with the normal maintenance of the mother. Evidence is offered to show that the condition may be produced by rations with high protein levels and low laxative effects, accompanied by lack of exercise and unclean surroundings. By combining the same feeds in different proportions to furnish a lower protein content and good laxative properties, normal offspring have been produced from the same sows.

The authors do not advocate the general use of iodine in the feed of all brood sows, but suggest that more attention should be paid to the proper combination of natural materials unfortified with potassium iodide. Wherever hairless pig production is endemic or persistent, iodides should, however, be used.

Contagious abortion in mares and cows, H. J. FREDERICK (*Utah Sta. Circ.* 28 (1918), pp. 3-18, figs. 10).—This is a general summary of information upon infectious abortion, which is prevalent among live stock in all parts of Utah.

Blackleg and its prevention, G. A. JOHNSON (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 214-221).—In this article are described the symptoms and post-mortem lesions of blackleg and the present methods of combating the disease, particularly by the use of germ-free blackleg vaccine and blackleg antiserum. It is stated that out of the several thousand cases treated with germ-free blackleg vaccine during the past year there has not been a single animal lost from blackleg later than eight days after vaccination, and only a small fraction of 1 per cent during the first eight days after vaccination.

The differentiation of the paratyphoid enteritidis group.—III, The uncommonness of *B. suispestifer* in the intestines of normal swine, E. O. JORDAN (*Jour. Infect. Diseases*, 22 (1918), No. 3, pp. 252-257).—Following a review of the findings of other investigators the author reports his own observations, in continuation of those previously noted (E. S. R., 38, p. 284), from which he has drawn the following conclusions:

"In all, 1,419 strains from the lower intestine of 291 normal swine have been tested. Only 40 of these have proved to be dextrose +, lactose —, and unable to liquefy gelatin. Using only the five tests [typical reaction milk, indol, salicin, sorbit, and rhamnose], 7 out of 40 tested gave the *suispestifer* reaction in milk (including slow production of alkalinity as in the paratyphosus A type), 14 out of 40 did not produce indol, 22 out of 32 did not ferment salicin, 14 out of 32 fermented sorbit, and 11 out of 25 fermented rhamnose. In no instance were more than three of these five characters of the *suispestifer* type united in one strain. Of the 26 strains closest to the true type, 9 differed in two of the three differential tests, 7 in three, and 9 in four. These strains have also been tested with paratyphoid B, *suispestifer*, and enteritidis serums sufficiently potent to agglutinate the homologous organisms in 5,000:10,000 dilution, but not one has ever shown more than a trace of agglutination in 1:100 dilution.

"It must be concluded, therefore, that the occurrence of true *suispestifer* strains in any abundance in the intestines of normal swine in this country is a rarity. The alleged frequency of occurrence of these bacilli reported from some places in Europe may perhaps be due to the inclusion of a high proportion of hogs that had become permanent or temporary carriers through their association with infected animals. Perhaps in some instances, also, identification has been made on the basis of too few biologic and cultural characters. Some writers describe indol-producing strains as if they were to be differentiated hardly or not at all from typical members of the group. In the course of my examination in the past four years of some hundreds of typical and atypical *suispestifer* and paratyphoid bacilli, I have never yet found an indol-producing bacillus that did not differ in some other cultural respect or that agglutinated to any degree showing a biologic relationship with the type organisms. The observations recorded in this paper suggest that the true *B. suispestifer* is not a common inhabitant of the intestine of normal swine, and that its occurrence in these animals is to be looked upon as an expression of the 'carrier' condition."

Important points in determining the presence of hog cholera in the herd (*Va. Dept. Agr. and Immigr. Bul.* 126 (1918), pp. 90-102, figs. 6).—This article is a general discussion of the symptoms of hog cholera, the changes in body tissues noted on post-mortem examinations, and the treatment of the disease by the use of antihog-cholera serum. Directions are given for obtaining and using the serum, and suggestions are offered regarding the prevention of the spread of the disease.

Some biological and control studies of *Gastrophilus hæmorrhoidalis* and other bots of horses, W. E. DOVE (U. S. Dept. Agr. Bul. 597 (1918), pp. 51, pls. 5, figs. 4).—This is a report of studies made of three species of horse bots occurring in the United States, each of which is a source of considerable injury to horses, namely, the common bot-fly (*Gastrophilus intestinalis* [equi]), the throat bot-fly (*G. nasalis*), and the nose fly (*G. hæmorrhoidalis*). The injury which they cause is produced through worryment at the time the eggs are laid and by the attachment of the larvæ in the alimentary tract.

G. intestinalis and *G. nasalis* are widely distributed in the United States, but *G. hæmorrhoidalis* is confined to the North Central and northern Rocky Mountain States. "The nose fly is by far the most annoying to horses at the time its eggs are laid. The adults appear early in June and reach the maximum of abundance during the first half of the season, disappearing with killing frosts. The eggs are deposited on the minute hairs on the lips, and those near the edges which are kept moist and receive friction hatch in from 5 to 10 days. The larvæ are taken in with food or water and attach themselves to the walls of the stomach. Here they remain until the following winter or spring and then migrate to the rectum, where they reattach. Before leaving the host they usually attach close to the anus and protrude from it. They remain in this position from 40 to 71 hours.

"After dropping to the ground the bots seek protection and pupate from 18 to 170 hours later. The pupa stage lasts from 21 to 68 days. The adults are very active, and as they deposit only one egg at a time they are not so frequently seen about horses as are the adults of the common bot-fly. They take no food in the adult stage. Their length of life is from 1 to 7 days.

"The throat bot-fly deposits its eggs on the hairs under the jaws and to some extent on the shoulders and other parts of the host. The larvæ of this species attach themselves to the walls of the pharynx and also to those of the stomach and duodenum. They do not reattach in the rectum or at the anus, as do the bots of the nose fly. Pupation occurs in from 1.5 to 2 days after the larvæ have passed from the host, and adults emerge in from 20 to 56 days later. The adults are somewhat longer lived than those of the nose fly. The flies cause considerable annoyance to horses during oviposition, but not as serious as in the case of the nose fly.

"The common bot-fly usually appears later in the season than the nose fly and becomes most abundant just before killing frosts. The eggs are deposited on all parts of the body, but preferably on the fore legs. They hatch upon the application of moisture and friction. From 9 to 11 days after oviposition appears to be the most favorable period for hatching, although some may hatch as early as 7 days and others as late as 96 days after oviposition. The larvæ attach in any part of the stomach, but the last-stage bots are found mostly in the left sac. They continue to drop from the host for a long period of time. Pupation takes place in protected places on the surface of the soil, and the pupa stage lasts from 40 to 60 days."

It is pointed out that all *Gastrophilus* larvæ are extremely resistant to chemicals. The treatment of horses with carbon disulphid in three doses followed by a physic is satisfactory if administered late in the fall, whereas spring treatment is less effective, as the full-grown larvæ are more resistant, and many of the nose-fly bots have left the stomach and passed back to the rectum at that time. Larvæ of *G. hæmorrhoidalis* may be removed from the rectum mechanically, but this is laborious. The use of enemas containing insecticides is ineffective. As a repellent pine tar mixed with other material gave good results against the common bot-fly and the throat bot-fly.

"Various nose protectors are in use against *G. hæmorrhoidalis*, but there are objections to many of them. A piece of leather suspended below the lips from the bit rings is said to be the simplest and best. For animals on pasture a halter with a box-like arrangement and throat cover has been devised to protect horses against infestation by all three species."

Kerosene oil used as a wash is ineffective in destroying the eggs of *Gastrophilus*, but certain other substances, including carbolic acid containing 2 per cent phenol, have given good results in destroying the eggs.

A bibliography of 38 titles is included.

Filariasis in native Hungarian horses, IV, D. WIRTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 18 (1917), No. 4-5, pp. 380-413, pls. 4; abs. in *Trop. Vet. Bul.*, 5 (1917), No. 4, pp. 237-248, figs. 3).—This paper deals particularly with the morphology and biology of the microfilariae in the blood of Hungarian horses.

Fistula of the withers and poll-evil, L. A. MERILLAT (*Chicago: Amer. Vet. Pub. Co.*, 1917, pp. 133, figs. 15).—This handbook deals with two prevalent diseases of the horse.

A contribution to the study of lymphangitis of the horse, HAAN and AUGER (*Rev. Gén. Méd. Vét.*, 26 (1917), No. 310, pp. 469-485).—A discussion of epizootic and ulcerous lymphangitis.

Acute hepatitis and nephritis of the hen, B. F. KAUFF (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 3, pp. 421-424, figs. 2).—This is a report of two cases of associated acute hepatitis and nephritis, which were studied at the North Carolina Experiment Station.

Spirochetes, H. NOGUCHI (*Jour. Lab. and Clin. Med.*, 2 (1917), Nos. 6, pp. 365-400, figs. 3; 7, pp. 472-499).—The first paper consists of a comprehensive review of the knowledge of these organisms, accompanied by a list of 129 references to the literature. The second deals with the transmission of spirochete and treponema to man and animals and their filterability, cultivation, and immunity and immunization, and includes a list of 154 additional references to the literature.

International catalogue of scientific literature. R—Bacteriology. QR—Serum physiology (*Internat. Cat. Sci. Lit.*, 12 (1917), pp. VIII+300+111+24).—The schedules have been revised in accordance with the decisions of the international convention of 1905. The literature indexed is mainly that of 1912, but portions of the literature of 1901 to 1911 are included, also some entries dated 1913.

RURAL ECONOMICS.

The requisites of a national food policy, W. H. HAMILTON (*Jour. Polit. Econ.*, 26 (1918), No. 6, pp. 612-637).—This article includes a general discussion of the nature of the food problem, both in the United States and the allied and neutral countries of Europe, and the resultant burden placed upon the United States. It is stated that the basis underlying a food policy must be one of either direct or indirect diversion of economic resources to national purposes. The obligations imposed upon both the consumer and producer are discussed, and the conclusion is arrived at that the real solution of the problem calls for a positive policy on the part of the Government in supervising the proper distribution of food. Authoritative regulation must include price-fixing, but this can not succeed unless it is based on a complete understanding of the nature of the price system and the relation of particular prices to economic conduct.

Report of the [Porto Rico] food commission (*Rpt. Food Com. [P. R.]*, 1917, pp. 19).—The commission discusses the methods used to alleviate the food shortage, stabilize prices, facilitate local distribution, and stimulate production.

Food situation in central Europe, 1917, A. MAYLANDER (*U. S. Dept. Labor, Bur. Labor Statist. Bul. 242 (1917), pp. 128*).—The information contained in this pamphlet was procured from files of leading daily newspapers of central European countries, particularly of Germany. The material covers the food situation in Germany, Austria, Hungary, Bulgaria, and Turkey during 1917, up to the end of October. For each country there is given a summary of the food situation, an outline of the food policy for the coming year, harvest reports, food orders relating to individual foodstuffs, comments on and criticisms of these orders and their practical application, data on the supply and prices of individual foodstuffs and rations, war kitchens, profiteering, illegal procuring of food, food card systems, measures for the cheapening of food for the poorer classes, and the effect of the food shortage on the health of the civilian population.

Factors in the study of the cost of living in Portugal, 1914–1916 (*Lisbon: Min. Finances, Bur. Statist. Agr., 1917, pp. 31*).—In this report are given statistical data indicating the prices of important agricultural products by districts.

Economic situation in Indo-China, 1916 (*Bul. Écon. Indochine, n. ser., 20 (1917), No. 126, pp. 441–482*).—This report discusses the extent of the agricultural product, import and export trade, and the damage done by the various types of animal diseases.

Forecasting the yield and the price of cotton, H. L. MOORE (*New York: The Macmillan Co., (1917), pp. VIII+173, figs. 13*).—The author has outlined in considerable detail a method of forecasting the yield of cotton from the weather reports, and maintains that in 17 out of 20 cases the forecasts from the weather were more accurate than the forecasts from the condition of the crops by official methods.

[Market problems of interior Alaska], J. W. NEAL (*Alaska Stas. Rpt. 1916, pp. 50, 51*).—It is pointed out that the native potatoes have finally superseded the imported product, very few potatoes having been shipped into the region around Fairbanks in the past two years.

Attention is also called to the possibility of extending the production of timothy hay, poultry, and poultry products to meet local demands.

The cooperative movement in Russia: Its history, significance, and character, J. V. BURNOFF (*Manchester, England: 1917, Coop. Printing Soc. Ltd., pp. 162, figs. 38, pl. 1*).—This is stated to be the first attempt to give in the English language a connected systematic survey of the cooperative movement in Russia. The author explains conditions under which the Russian peasant was formerly obliged to work and the various attempts toward cooperation. The basis of the whole movement is explained to secure opportunity to purchase goods and sell the product of labor without the intervention of middlemen and to supply small credit at low rates.

Four principal phases of the Russian cooperative movement are outlined, represented by agricultural societies, consumers' societies, credit and loan savings societies, and cooperative unions. The agricultural societies (268 in 1901, and 6,000 in 1916) are educational organizations to provide lectures, exhibitions, libraries, etc. Fifty-nine per cent of the members of consumers societies are peasants and 30 per cent are workmen. In 1914 there were 10,000 societies, with a membership of 1,530,000; in 1917 there were 20,000 societies. There are two types of credit associations for loans and savings and for small credit, with a membership of 10,000,000, and with the aim to put down the userer. They purchase agricultural equipment, lease and build works, and advance security on crops. More than one-half their capital is raised by the societies themselves, without State assistance.

Due credit is given the Zemstvos for publishing books, sending out lecturers, and aiding in the educational work known as "The People's Palaces."

Linking the movement in Russia with that in England and other countries, the author finishes with an explanation of the project for an International Cooperative Exchange.

Agricultural cooperation in Denmark (*Ill. Dept. Agr., Circ. 259 (1918), pp. 7*).—This report points out the effect of agricultural cooperation in building up the wealth and intelligence of the rural communities.

The farmer, ALISSA FRANC (*In Use Your Government. New York: E. P. Dutton & Co., 1918, pp. 1-149, pls. 13, figs. 9*).—In these pages the author discusses some of the ways in which the Federal Government is aiding the farmer, especially through the various bureaus of the U. S. Department of Agriculture, Bureau of Education, Public Health Service, etc., and the financial assistance which the farmer may receive through the Federal Farm Loan Bureau.

Balancing country life (*New York: Association Press (1917), pp. XIII+136, pls. 1*).—This is a report of the country life conference held in Chicago on October 25, 1916, under the auspices of the International Committee of the Young Men's Christian Association, and participated in by workers from the organization itself and others interested in rural life problems. It discusses the relationship of the home, school, church, and community, to rural life.

The American Farm Management Association.—Record of the proceedings, 1916 (*Amer. Farm Management Assoc. Proc., 7 (1916), pp. 134, figs. 5*).—These proceedings have been previously noted (*E. S. R., 36, p. 297*).

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt. 4 (1918), No. 4, pp. 33-44, figs. 10*).—This number contains the crop summary for March, 1918, data regarding the condition of farm animals April 1 and estimated losses during the year, estimated farm value of important products March 15 and April 1, average prices received by producers, and range of prices of agricultural products at important markets. It also gives special data with reference to the foreign trade of the United States in agricultural products, trend of prices, wages, and land values, cycle of live stock prices, edible bean production in 1917, the total number of sheep of specified breeds, the value of plowed land, beet sugar production for 1916 and 1917, etc.

Pasture land on farms in the United States, E. A. GOLDENWEISER and J. S. BALL (*U. S. Dept. Agr. Bul. 626 (1918), pp. 93, figs. 7*).—Data obtained from a tabulation of the agricultural schedules collected by the Bureau of the Census in 1910 are presented.

"Of the total farm land, which comprised about 879,000,000 acres in 1909, somewhat more than one-third was in crops, about one-third was in pasture, and somewhat less than one-third comprised all other kinds of farm land." A large part of the pasture land is unimproved, 99,000,000 acres being in woodland and 108,000,000 in other unimproved pasture. The improved pasture represents about 84,000,000 acres, or nearly one-tenth of the total land in farms.

[Agriculture in the Commonwealth of Australia], G. H. KNIBBS (*Off. Yearbook Aust., 10 (1901-1916), pp. 235-392, figs. 6*).—These pages continue information previously noted (*E. S. R., 36, p. 93*), by adding data for later years.

Modern Crete, L. FRANCHET (*Rev. Sci. [Paris], 56 (1918), No. 3, pp. 75-81*).—The author describes the population and the agriculture, especially the products of the vineyards, cereals, olives, citrus fruits, tobacco, and coffee.

Annual report on reforms and progress in Chosen (Korea), 1915-16 (*Ann. Rpt. Reforms and Prog. Chosen (Korea), 1915-16, pp. X+161, pls. 19*).—This report adds later information to that previously noted (*E. S. R., 36, p. 690*).

AGRICULTURAL EDUCATION.

College teaching in agriculture, F. A. WAUGH (*School and Soc.*, 7 (1918), No. 162, pp. 130-132).—The author calls attention to what he terms an obsession for subject matter to the exclusion of pedagogic technique, and the faulty organization of subjects into a curriculum in the college teaching of agriculture. He proposes five principles, formulated by half a dozen instructors studying these questions privately at the Massachusetts Agricultural College, by which to guide the student's work in the technical field.

These principles are stated as follows: (1) The establishment of a motive; the usual primary motive being the expectation of self-support in a profession, to which later will be added professional pride and certain important altruistic impulses. (2) From this primary and general motive specific problems must be developed in the freshman and sophomore years, such problems, for example, as what kinds of fruit to grow, what soils to select, etc. (3) The materials of instruction must be chosen with a view to answering these questions, and thus immediately become technical material to be presented in technical courses.

In the author's opinion "the present assumption that botany, physics, etc., are 'indispensable' as 'foundation' subjects for pomology or landscape gardening is wholly untenable, and the retention of such subjects in a general required list is disastrous to the professional curriculum. The further popular assumption that such subjects give valuable 'general training' is both beside the point and without proof." (4) All the professional instruction must be coordinated about these questions, these in turn being coordinated about the primary motive. This coordination must be close and vital. It is found that while at present "the science courses are given professedly in the interest of the technical majors, only a very small quantity of the materials ever becomes available for practical application. The applications can be made efficiently only when and where the question arises; that is, in the technical department of market gardening or poultry husbandry. The answer must come from chemistry or bacteriology or meteorology, but it is utterly impossible for the chemist, bacteriologist, or meteorologist to make the application to the student's need." (5) In order to secure this effective coordination and also to eliminate the large amount of material which does not function in response to the foregoing principles, it becomes necessary for all of the professional work to be under the control of the particular technical department conducting the major. In place of formal science as now given in the science departments, the professional pupil would take practical applied science in his major department.

College teaching in agriculture, R. A. DUTCHER (*School and Soc.*, 7 (1918), No. 169, pp. 353-356).—In this reply to the preceding article the scheme advanced is held to be untenable.

In the author's opinion "the very nature of agricultural courses is such that the men employed to manage the various divisions of the work must necessarily be experts noted for their knowledge of and their discoveries in their particular fields. Such men are necessarily the logical men to present such work in the college classroom. In such courses pedagogy will always take a back seat for subject matter, and only occasionally will be found the specialist who has the rare quality of developing the pedagogical phases of his specialty on a basis equal to his research ability." It is contended that the fundamental courses of a general cultural and scientific nature, which it is generally agreed should be offered during the first two years of every well-regulated college or university, will not only develop the student's ability to think straight and reason correctly, but will also help the student to appreciate and understand nature

and her methods, to become acquainted with laws and principles without which the more advanced courses could not be mastered efficiently, as well as to give the student a clearer idea as to electives.

The author thinks that "under Professor Waugh's system he would develop a narrow, practical viewpoint which is deplorably manifest in agricultural colleges even now. . . . If all students were to start taking horticultural courses, for example, in the freshman year and omit the science courses, where should we obtain our future specialists? . . . It would seem that the practical farmer and the student who wishes to go back to the farm should take the practical short courses which are designed especially for this type of student." If the curricula are crowded with useless courses the author suggests that some of the vocational courses, for which college credit is being given in many institutions, be first eliminated rather than the sciences which have made modern agriculture what it is.

Agricultural education: Organization and administration, L. S. HAWKINS (*Fed. Bd. Vocational Ed. Bul. 13 (1918), pp. 42*).—This bulletin has been prepared to supply information and suggestions concerning the organization and administration of vocational agricultural education under the Smith-Hughes Act. It includes a brief review of the development of Federal legislation relating to agricultural instruction; statements of provisions to be made in State plans for meeting the requirements of the act; and studies and investigations to be undertaken by the Federal Board for Vocational Education, the Division of Agricultural Instruction of the U. S. Department of Agriculture, and the Bureau of Education. The text of the Smith-Hughes Act and statistical tables showing the prospective annual grants thereunder by the Federal Government are appended.

[**Agricultural education and research in the Province of Quebec, 1916-17**], J. E. CARON (*Rpt. Min. Agr. Prov. Quebec, 1917, pp. XII+227, pls. 30*).—This annual report of the Department of Agriculture of the Province of Quebec includes detailed information concerning the activities of the agricultural school at Ste. Anne de la Pocatière, Oka Agricultural Institute, McDonald College, Montreal Veterinary School, St. Hyacinthe Dairy School, 53 household science schools, experiment stations, school gardens, and extension work under its control.

Agricultural teaching at the university (*Jour. Dept. Agr. Victoria, 15 (1917), No. 6, pp. 358-366*).—This is the report of a committee appointed by the Council of Agricultural Education of Victoria, Australia, to consider the success achieved in the university teaching of agriculture in Victoria and elsewhere, whether a single degree course in agriculture in Melbourne University should be continued or replaced by specialized science courses, and the type of training that would best qualify students to become expert officers of agricultural departments.

The committee finds that the attendance of the school of agriculture at Melbourne has not been as large in recent years as might have been expected, mainly on account of the want of remunerative openings for graduates at the completion of their course. The present course has not succeeded in training farmers, although it was not designed for this purpose, as the agricultural colleges provide special facilities for such training. The principal objective of the course at the university should be to train agricultural scientists who will become instructors, administrators, or research workers. A lack of touch is also found between the university and the man on the land, which it is suggested could be overcome by the appointment of officers of the agricultural department as part time lecturers in subjects in which it is most desirable that the lecturers should be in close touch with their practical application to the

industry. It is found that the single degree course has lacked the special character and thoroughness necessary to the full realization of its aims, due almost solely to the want of financial means for equipment, etc.

The committee recommends the continuance of the general course in agricultural science with adequate provision for teaching it, and the addition of the following subjects to the curriculum: Agricultural zoology and botany, animal physiology, veterinary science and stock breeding, dairying, agriculture, entomology, plant pathology, and the principles of horticulture and of viticulture. The course should be extended from three to four years, and the second year, including practical farm work extending over four full days a week during the year, carried out at the Werribee State Research Farm instead of the Dookie College as heretofore; a special building should be erected for agricultural purposes; and the Government should undertake to appoint annually for the next five years at least six graduates in the departments of agriculture and education and the State Rivers and Water Supply Commission.

Essentials in the training of teachers of vocational home economics, ANNA E. RICHARDSON (*Ala. Girls Tech. Inst. Bul., n. ser., No. 44 (1918), pp. 10-20*).—The author outlines in a general way the content of a course in vocational home economics based on an analysis of the functions of the women in the house, and discusses the essential factors of the training of teachers for vocational home economics. These factors are summarized as follows: A recognition of the fact that vocational education is a new type of education and that its guiding principles are not the same as those of general education; vocational home economics courses based upon the needs of the housewife gained through the analysis of the work of the home maker; sufficient experience as a home maker to have first-hand knowledge of the problems and a sympathetic appreciation of the opportunities and difficulties of home making; and a course of study made up of vocational, related, nonvocational, and professional education courses so balanced that the students develop skill, through training and practice, a fundamental understanding of the processes involved in the vocation of home making, enlarged social and civic capacity, and a power to translate their education in terms which will fit the life and needs of their future students.

Marketing and housework manual, S. AGNES DONHAM (*Boston: Little, Brown, & Co., 1917, pp. [6]+241, pls. 4, figs. 3*).—Part 1 of this manual deals with general rules for marketing, marketing charts to assist the student or housewife in the choice, purchase, and care of foodstuffs, menu making, menu and order sheets, the selection of foods, and a food inventory. Part 2 is devoted to housework rules and directions. The manual is stated to be the result of 20 years' study and experience in teaching.

Food problems, A. N. FARMER and JANET R. HUNTINGTON (*Boston and London: Ginn & Co., 1918, pp. XXII+90, figs. 5*).—The author states that the purpose of these problems is not to teach arithmetic, but to use arithmetic to teach the meaning, necessity, and practice of food conservation. Suggestive discussions which aim to illustrate what should be done with each problem are included. Useful information relating to food conservation and a list of free bulletins are appended.

The preparation and the preservation of vegetables, HENRIETTA W. CALVIN and CARRIE A. LYFORD (*U. S. Bur. Ed. Bul. 47 (1917), pp. 24*).—The authors briefly discuss the value of vegetables in the diet and give directions for cooking and preserving vegetables.

MISCELLANEOUS.

Report of Alaska Stations, 1916 (*Alaska Stas. Rpt. 1916, pp. 91, pls. 13*).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1916. Meteorological data and accounts of the extensive tests with field and garden crops, live-stock operations, and other lines of work are abstracted elsewhere in this issue.

Annual report of the director for the fiscal year ending June 30, 1917 (*Delaware Sta. Bul. 119 (1918), pp. 28*).—This contains the organization list and the report of the director on the work and publications of the station, including a financial statement for the fiscal year ended June 30, 1917. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 268 (1917), pp. 295-324+XVI*).—This contains the organization list of the station; abstracts of 10 papers previously noted, and abstracts of 6 papers noted elsewhere in this issue; meteorological observations noted on page —; a financial statement for the fiscal year ended June 30, 1917; an index to Bulletins 258-268, inclusive, which collectively constitute the thirty-third report of the station; and announcements as to the work, publications, and equipment of the station.

Annual Report of Nevada Station, 1917 (*Nevada Sta. Rpt. 1917, pp. 79, figs. 10*).—This contains the organization list, a report of the director on the work of the station, departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue, a list of the publications of the year, and a financial statement for the fiscal year ended June 30, 1917.

Thirtieth Annual Report of New York Cornell Station, 1917 (*New York Cornell Sta. Rpt. 1917, pp. XC+1203, pls. 44, figs. 323*).—This contains the organization list, reports of the director of the station and heads of departments, and reprints of Bulletin 321 revised, noted on page 167, and of Bulletins 288 revised, and 378-391, and Memoirs 9-11, all of which have been previously noted, and a financial statement for the fiscal year ended June 30, 1917.

Report of West Virginia Station, 1915 and 1916 (*West Virginia Sta. Rpt. 1915-16, pp. 51*).—This contains the organization list; a report of the director on the work, publications, and needs of the station; and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Wyoming Station, 1917 (*Wyoming Sta. Rpt. 1917, pp. 125-180, fig. 1*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1917, reports of the director and heads of departments, meteorological observations, and several special articles. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 1, pp. 16*).—This contains brief articles on the following subjects: Bovine Tuberculosis in Washington, by R. J. Donohue; Feeding the Dairy Calf, by A. B. Nystrom (see p. 182); Concerning the Organization of Drainage Districts, by F. W. Rader; Adjustments of Disputes between Buyers and Sellers of Farm Produce, by A. Hobson; Proved Farm Practices, by E. B. Stookey; Home-grown Feed for Poultry, by G. R. Shoup; and Poultry Notes, by Mrs. G. R. Shoup.

NOTES.

Arkansas Station.—H. R. Rosen, assistant botanist in the Indiana Station, has been appointed assistant plant pathologist. Dr. Woodruff has been appointed assistant veterinarian.

California University.—A new calendar has been adopted for the university, in order to assist in supplying farm labor during the harvest period. Instruction will be begun October 1 instead of in the third week of August as formerly.

The new university budget appropriates about \$10,000 for additional instruction for the college of agriculture in connection with the war work of the institution. The new positions authorized include a professor of pomology, poultry and soils specialists for extension work, an additional instructor at Davis, and a senior assistant librarian.

A short course for machine milkers has been held at Davis.

It is announced that California Gretel, a pure-bred Toggenburg goat at Davis, has broken the world's record for milk production by goats. In 365 consecutive days this animal produced 2,941.5 lbs. of milk containing 97.41 lbs. of milk fat. This milk production was equivalent to 24.5 times her body weight.

Minnesota University and Station.—A. H. Benton, assistant professor of farm management, resigned August 1 to become head of the department of rural economics and farm management of the Manitoba Agricultural College. E. B. Brossard, who is on leave of absence from the Utah College, has been appointed instructor in farm management beginning August 1.

Theodore E. Odland, instructor in agronomy and agronomist at Morris, A. C. Heine, instructor in farm engineering at Morris, and H. J. Beaumont, assistant in fruit-breeding research, are now in military service. Roy O. Bridgeford has been appointed instructor in agronomy and agronomist at Morris, and F. W. McGinnis, instructor in farm crops, beginning September 1. F. H. Steinmetz has been appointed assistant professor of farm crops and assistant agronomist of the station beginning July 1. August Haedecke has been appointed assistant in agronomy in the station, vice A. S. Merrill resigned to engage in commercial work. Miss Cornelia Kennedy, instructor in agricultural biochemistry and assistant biochemist, has been granted a year's leave of absence. Miss Josephine T. Berry has resigned as chief of the division of home economics, effective August 1, in order to continue as assistant director of home economics of the Federal Board for Vocational Education, and has been succeeded by Miss Mildred Weigley, who has been acting chief of the division. Miss Nola Treat has been appointed manager of dining halls and assistant professor of institutional management, and Miss Lenore Richards, assistant manager and instructor in institutional management.

Missouri University and Station.—The establishment of three new soil experiment fields is authorized, one on the Bates silt loam in southwest Missouri, one on the Union silt loam south of the Missouri river, and one on the Lebanon silt loam in the central Ozark region.

L. F. Childers, associate professor of soils in the extension service, resigned May 1; W. L. Nelson, assistant in agricultural extension, May 15; I. F. Nuckols,

assistant in animal husbandry, June 1; and M. N. Beeler as agricultural editor, July 15. H. F. Robinson, foreman of the poultry plant, resigned June 1 and was succeeded by J. W. Perry. A. J. Durant, research assistant in veterinary science, has been granted leave of absence for military service, beginning May 1.

Recent appointments include Miss Helen Johann as research assistant in plant pathology, beginning July 1; Samuel Bryan Shirkey as assistant in agricultural chemistry, beginning June 15, and Wm. DeYoung as assistant in the soil survey, beginning June 1.

New Mexico College and Station.—Large and well equipped barns for dairy and beef cattle have been completed and horse, pig, and sheep barns are under construction. Important improvements are also being made in the live stock.

An extensive underground irrigation distribution system has been installed on the college campus. This system will furnish water for ornamental trees and shrubs and some of the experimental plats.

F. C. Werkenthin, assistant professor of biology and assistant biologist, has resigned to accept a position as botanist at the New Hampshire College.

North Carolina College and Station.—Dan T. Gray, chief of the animal industry division, has been appointed specialist in animal husbandry in the U. S. Department of Agriculture for cooperative work between the States Relations Service and the Bureau of Animal Industry.

Pennsylvania College and Station.—Fred S. Hultz, assistant in animal husbandry, has been granted leave of absence to engage in Y. M. C. A. work in France. C. H. Hadley, jr., and L. S. Kleinschmidt have been advanced from instructors to assistant professors of economic entomology and poultry husbandry, respectively.

Pennsylvania Institute of Animal Nutrition.—J. E. Isenberg and M. C. Lewis have resigned as assistants in animal nutrition.

Porto Rico Insular Station.—I. A. Colón has been appointed first assistant chemist in chemical engineering.

South Dakota College and Station.—Dr. N. E. Hansen has recently received the George Robert White gold medal of honor awarded him in 1917 by the Massachusetts Horticultural Society "for eminent service in horticulture."

Robert Wylie has been appointed assistant professor of dairy husbandry, vice C. Larsen whose resignation has been previously noted.

Utah College.—John T. Caine, 3d, director of agricultural extension, has been appointed specialist in animal husbandry in the U. S. Department of Agriculture for cooperative work between the States Relations Service and the Bureau of Animal Industry.

Vermont University.—A unit of nine students has been enrolled in the National Woman's Land Army of America for farm work near Brattleboro from May 6 to September 15. Gardening, poultry raising, care of orchards, and harvesting are among the lines of work being undertaken.

Wyoming University.—Dr. Aven Nelson, acting president during the past year, has been appointed president.

American Association of Agricultural Legislation.—This association effected a tentative organization at Philadelphia, December 28, 1917, and a permanent organization at Chicago, May 10-11, 1918. Its activities thus far have dealt particularly with marketing problems. Resolutions have been adopted endorsing the principles of collective bargaining by producer and consumer in the sale and purchase of farm crops and of the collective purchase of supplies by groups of farmers, and advocating legislation to safeguard these practices. Other resolutions have dealt with the price of wheat and the buying and storing of food products.

The officers consist of Elwood Mead of the University of California, president; Dr. Geo. F. Warren of Cornell University, vice president; Dr. Richard T. Ely of the University of Wisconsin, secretary; and Dr. H. C. Taylor of the University of Wisconsin, treasurer.

American Association of Agricultural College Editors.—This association held its sixth annual conference at the University of Tennessee, June 20-22, with representatives of 20 States in attendance. The first day's program consisted mainly of topics bearing upon correspondence courses in agriculture. The remaining days were given over to a discussion of printed forms of agricultural educational work. Special attention was devoted to war time informational services, including an address by Edwy B. Reid, chief of the Division of Publications of the U. S. Department of Agriculture, on the publications of this Department.

Officers for the following year were elected as follows: President, Bristow Adams of Cornell University; vice president, M. G. Osborn of Louisiana State University; secretary-treasurer, Frank C. Dean of Ohio State University; and additional members of the executive committee, Harry B. Potter of the University of Tennessee and Frank H. Jeter of the North Carolina College.

Horticultural Station in Brazil.—The experiment station at Deodora, Brazil, has been converted into a horticultural station to serve as a model for farms of the region, as a practice school for students, and as a nursery for the production of fruit trees for free distribution. Experimental work will include the improvement of domestic fruit trees and introduction and acclimatization work, cultural studies, the combating of insect pests, studies of methods of transporting plants and packing fruits, and fruit utilization and marketing. Apprenticeships will be provided for boys from 14 to 15 years of age for instruction in pomology. Some attention will also be given to vegetable growing and the provision of instruction in improved methods of plowing, etc. A staff consisting of a director and four assistants is to be provided.

Age Limit of Agricultural College Students in Canada.—On account of the depletion of enrollment due to the war the age limit of admission to the School of Agriculture of Ste. Anne de la Pocatière has been reduced for the duration of the war to 14 years, and that at the Oka Agricultural Institute to 15 years for the regular course and 14 for the 2-year practical course. A special class of 50 junior students of from 14 to 15 years of age is to be opened at the Manitoba Agricultural College for either the regular first year work or the selection of special subjects.

Degree Course in Household Science in Quebec.—The work for the new degree of Bachelor of Household Science in the Province of Quebec will consist of the work of the first two years of the B. A. or B. S. courses in the faculty of arts in McGill University, and the work of the third and fourth years at Macdonald College. It will include English and economics, the same as that given to the third and fourth year students in the faculty of agriculture; science subjects, such as chemistry, physics, biology, and bacteriology, partly taken in the school of agriculture and partly in the school of household science; and the technical subjects—foods, textiles, clothing, the home, and the institution—which will be given entirely by the school of household science. The course represents two-fourths academic work, one-fourth scientific, and one-fourth technical—a proportion very similar to that given for the B. A. degree in household science at Toronto University and somewhat similar to that given in a large number of institutions in this country, such as Chicago, Columbia, Wisconsin, and Cornell universities where similar courses have been in operation for over 10 years.

Necrology.—Dr. Alexander Francois Liautard, founder of the first veterinary medical school in this country and one of the founders of the U. S. Veterinary Medical Association, as previously noted (E. S. R., 29, p. 301), died at his home in France, April 20, age 84 years. Dr. Liautard was for many years editor of the *American Veterinary Review*, and throughout his life intensely interested in veterinary education. He was the author of a long list of standard text books for the veterinary profession. In 1884 he received the decoration of Chevalier du Merite Agricole from the French Government.

Maurice de Vilmorin, member of Vilmorin-Andrieux & Company of Paris, France, died April 21 at the age of 69 years. He was a well known horticulturist and dendrologist, and his collection of shrubs growing at Les Barres was perhaps the most comprehensive in Europe.

Frank N. Meyer, agricultural explorer for the U. S. Department of Agriculture in China, Siberia, and Turkestan for nearly ten years, has died in China. He was the introducer of hundreds of species and varieties of plants from these regions, many of great economic value. Among his most recent discoveries was the location of the original home of the chestnut bark disease.

The death in France from wounds is reported of Lieut. E. J. Woodhouse of the British Army. Lieut. Woodhouse was appointed economic botanist to the Government of Bengal in 1908 and in 1911, principal of the Agricultural College of Bihar and Orissa. He had worked on several problems in economic botany and entomology, including the potato moth.

Lieut. Vernon King, scientific assistant in cereal and forage crop investigations in the Bureau of Entomology of the U. S. Department of Agriculture, has died from wounds received in the aviation service of Great Britain.

The recent death is noted of K. Toyama, professor of zoology in the Imperial University of Tokio. He was a graduate of the College of Agriculture of the university in 1892 and had worked mainly on the breeding of silk worms.

New Journals.—*Public Roads* is being issued monthly by the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture. It is the intention to present matters of special interest to those concerned with the construction and maintenance of roads and to supplement the bulletins of the Office by the prompt publication of the results of its experiments and other phases of its work. The initial number contains a complete record of the status of each State project submitted under the Federal Aid Road Act up to February 28, 1918, and it is expected to present a corrected list monthly. Various short articles are included, as well as a brief summary of forthcoming publications of the office.

Annals of the Phytopathological Society of Japan is being published by that society. The initial number contains several articles printed in English or German, as well as Japanese; a brief historical sketch in English by M. Shirai, professor of phytopathology of the Agricultural College of the Imperial University of Tokio, on the development of phytopathology in Japan, and a considerable number of abstracts in Japanese of phytopathological articles.

The Potato Magazine is being published by the Potato Association of America. The initial number contains several articles by agricultural college and Federal officials on various phases of the potato industry.

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No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Determination of various forms of nitrogen in bovine flesh, including the products of hydrolysis of some of the proteins, I, II, W. E. THRUN and P. F. TROWBRIDGE (*Jour. Biol. Chem.*, 34 (1918), No. 2, pp. 343-353, 355-362).—Two papers are reported.

I. *The hcrone bases of some flesh proteins.*—The proteins used were (1) the cold water-soluble fraction, a mixture of stroma and plasma proteins containing albuminoids and nucleoproteins, and (2) the cold water-soluble heat-coagulable fraction, a mixture of plasma protein with the albumins and globulins of flesh. It was found that the cold water-insoluble proteins yield on hydrolysis less humin, ammonia, and histidin and more arginin nitrogen than do the coagulated beef proteins. A comparison of the composition of the cold water-insoluble samples from the flesh of a newborn calf and of a 5-year-old steer shows that the latter contains less ammonia and histidin and more arginin, indicating that during growth the insoluble proteins change in composition.

II. *The bromination of the hydrolysates of some beef flesh proteins.*—The tyrosin nitrogen in some of the samples used in the investigation noted above was determined by the bromination method of Plimmer and Eaves (E. S. R., 31, p. 807). No significant differences in results between this method and the method of isolation and weighing were found. A determination of the bromin consumption of cystin was made and the amount of bromin absorbed when the cystin was treated with an excess of nascent bromin for 15 minutes was found to be about 10 atoms per molecule.

The bromination method was also applied to the determination of histidin. Results on three different proteins by this method agreed well with the results obtained by the Van Slyke method. The method consisted of brominating the solution of the bases of the coagulable protein sample, and deducting from the weight of the bromin absorbed the weight absorbed by the cystin as calculated from the cystin nitrogen found by determining sulphur in another sample and from the bromination value of cystin of 10 atoms per molecule. To the percentage thus obtained is added 1.17 per cent as a correction for the solubility of hystidin in the presence of phosphotungstic acid. Attention is called to the fact that the method requires only two determinations as against three by the Van Slyke method.

The filtrate from the bases was brominated and from these data approximate values for the tryptophane content were calculated.

The globulin of buckwheat, *Fagopyrum fagopyrum*, C. O. JOHNS and L. H. CHERNOFF (*Jour. Biol. Chem.*, 34 (1918), No. 2, pp. 439-445).—The

globulin of buckwheat flour was obtained by extracting the flour with from 5 to 10 per cent sodium chlorid solution, precipitating the protein with ammonium sulphate, redissolving in water, and dialyzing the solution until the salts were removed. The yield was about 20 per cent of the nitrogen present. The percentage of basic amino acids in the globulin was arginin 12.97, histidin 0.59, lysin 7.9, and cystin 1.

The high percentage of basic amino acids is considered of importance in view of the fact that buckwheat flour is frequently used with wheat flour. Although a mixture of these two flours would have a lower protein content than wheat flour alone, the proteins of the mixed flour would probably be more efficient owing to the higher percentage of basic amino acids.

Stizolobin, the globulin of the Chinese velvet bean, *Stizolobium niveum*, C. O. JOHNS and A. J. FRANKS (*Jour. Biol. Chem.*, 34 (1918), No. 2, pp. 429-438).—The principal protein extracted from the Chinese velvet bean by means of a sodium chlorid solution is a globulin named by the authors stizolobin. The percentage of the basic amino acids in stizolobin determined by the Van Slyke method was cystin 1.2, arginin 6.72, histidin 2.65, and lysin 8.27. Tryptophane was also found to be present.

Lecithin and allied substances: The lipins, H. MACLEAN (*London and New York: Longmans, Green & Co.*, 1918, pp. VII+206; rev. in *Jour. Amer. Med. Assoc.*, 70 (1918), No. 22, p. 1631).—This volume of the series of monographs on biochemistry deals with the subject of lipins.

The author defines lipins as "substances of a fat-like nature yielding on hydrolysis fatty acids or derivatives of fatty acids and containing in their molecule nitrogen or nitrogen and phosphorus." This limits the use of the term at present to the cerebrosids and phosphatids, instead of including all "constituents of protoplasm having a greasy feel soluble in alcohol-ether and insoluble in water," the sense in which the term is used by Mathews¹ and other American authors. The subjects discussed are the chemistry of the phosphatids—lecithin, cephalin, sphingomyelin, and cuorin; occurrence, methods of extraction, isolation, and purification of phosphatids; the cerebrosids—phrenosin and kersasin; protagon; allied lipins—carnaubon, paranucleo protagon, jacorin, and other insufficiently characterized substances; plant lipins; and the function of lipins.

New observations on the decomposition of inulin and inulids in chicory root, B. GESLIN and J. WOLFF (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 10, pp. 428-430; abs. in *Chem. Abs.*, 12 (1918), No. 13, pp. 1396, 1397).—Further investigations on the effect of different yeasts on the inulids of chicory root (*E. S. R.*, 38, p. 502) are reported and discussed.

Some constituents of the American grapefruit (*Citrus decumana*), H. F. ZOLLER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 364-374, figs. 2; abs. in *Analyst*, 43 (1918), No. 508, pp. 270-272).—This article gives a brief history of the grapefruit and reports analyses of some of the more important constituents of the peel and juice.

The peel when distilled at reduced pressure with steam yielded a greenish-yellow oil with an odor of citral and having the following constants: Refractive index at 20° C., 1.475 and 1.478; optical rotation at 20°, +72.5 and +78.5; specific gravity at 20°, 0.845 and 0.86. Fractional distillation of the oil yielded the following constituents: *d*-limonene, 90 to 92 per cent; citral, 3 to 5; α -pinene, 0.5 to 1.5; geraniol, 1 to 2; linalool, 1 to 2; citronellal, trace; and linalyl and geranyl esters, trace.

¹Physiological Chemistry. New York; William Wood & Co., 1916, 2. ed., p. 61.

The residue remaining after the steam distillation of the peel on extraction with water yielded the glucosid naringin, which is the bitter principle of the grapefruit. Its empirical formula, as determined from carbon and hydrogen combustion and from a study of its cleavage products, appeared to be $C_{20}H_{28}O_{11} \cdot 4H_2O$ (air dried). There appeared to be a diminution of the naringin content during storage. Pectin was obtained from the peel after the removal of the oil and naringin by boiling for three hours and straining through cheese-cloth. The average recoverable pectin is estimated at 10 per cent of the peel weight.

The pulp or juice was analyzed for citric acid, sucrose, and reducing sugars. The citric acid was found to decrease during storage and the reducing sugars and sucrose to increase.

The large sugar, pectin, and glucosid content of the grapefruit suggests the possibility of utilizing the whole grapefruit for the manufacture of commercial alcohol. The probable yield is estimated at from 10 to 15 gal. of proof spirit from 1 ton of grapefruit.

A bibliography of 42 references to literature on the subject is appended.

The edible litchi nut (*Litchi chinensis*), B. E. READ (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 5, pp. 817-822; *abs. in Analyst*, 43 (1918), No. 508, pp. 272, 273).—The edible litchi or Chinese hazel nut was found to be practically fat- and protein-free. The nitrogen-free extract was composed almost entirely of simple sugars, chiefly invert sugar. Citric acid was present, with possible traces of other fruit acids. Examination of the ash showed considerable amounts of calcium, magnesium, and iron, and of sulphate and phosphate ions. No iodine was found. The nut was not found to possess therapeutic properties ascribed to it in Chinese Materia Medica, but it is recommended as a good dietary supplement to foods rich in protein and to those lacking in mineral matter.

Yeasts for bread making (*Advisory Council Sci. and Indus., Aust., Rpt. Exec. Com. 1917*, p. 38).—A special study is reported of the growth in a malt wort, of yeast leading to rapid ripening of the dough.

In the preparation of yeast it has been found that the temperature of the wort during the growth of the yeast should be less than the temperature at which the dough stands. Abundant oxygenation favors the development of yeast fermenting rapidly. The presence of flour in the wort prevents any check in fermentation when the yeast is mixed with the dough. The wort is made with a decoction of hops, to which flour and ground malt are added. The mixture stands at 155° F. until the whole of the starch disappears. After straining the mash from the liquor the wort is boiled and cooled rapidly, placed in a sterilized pan, and beaten to aerate the liquid. It is then inoculated by the addition of a considerable amount of stock from the previous brew and the yeast is allowed to grow for 16 hours. With yeast thus prepared the time of raising the dough in the trough has been reduced to five hours.

A chemical study of enzym action, K. G. FALK (*Science*, n. ser., 47 (1918), No. 1218, pp. 423-429).—This is a general discussion of the subject, including a review of the work of other authors on the kinetics and chemical nature of enzym action and a brief survey of the scope, results, and conclusions of investigations conducted by the author and collaborators (E. S. R., 38, p. 709).

Equilibria in solutions containing mixtures of salts.—I, The system water and the sulphates and chlorides of sodium and potassium, W. C. BLASDALE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 344-347, figs. 6).—This is the first of a series of papers comprising a study of the phase-rule diagrams representing the equilibria which exist in aqueous solutions between certain salts. The system discussed in this paper consists of four components, namely,

water and any three of the four salts concerned. The experimental methods used are described and equilibrium diagrams at 0, 25, 50, 75, and 100° C. are given with accompanying tables of composition of the saturated solution.

The separation of the chlorids and sulphates of sodium and potassium by fractional crystallization, W. C. BLASDALE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 347-353, figs. 6).—The data referred to above are utilized in suggesting and testing the efficiencies of methods for the separation of certain pairs of salts which yield a common ion and for the recovery of potassium salts from the ash of kelp and from certain natural brines found in the desert regions of California, Nevada, and Utah. The separations discussed are potassium chlorid from sodium chlorid and from potassium sulphate, potassium sulphate from sodium sulphate, sodium sulphate from sodium chlorid, the salts of potassium from mixtures containing sulphates and chlorids of sodium and potassium, and potash from ash of kelp and from desert brine.

The author concludes that "it is not improbable that when the diagrams representing the equilibria which must exist in solutions which contain carbonates as well as sulphates and chlorids of sodium and potassium have been prepared it will be found possible to suggest methods by which the salts present in such waters can be profitably separated into commercial products. It is also possible that it may be found commercially feasible to precipitate most of the CO_3 ion, either as NaHCO_3 or CaCO_3 , from certain of these waters and recover the potassium salts in the residual solution by the methods already described."

Some limitations of the Kjeldahl method, H. C. BRILL and F. AGCAOILI (*Philippine Jour. Sci.*, Sect. A, 12 (1917), No. 5, pp. 261-265).—This article reports determinations of the nitrogen content of various classes of nitrocarbons by means of the Kjeldahl method to determine what type of compound yields only a part of its nitrogen by this process.

Low results were obtained with pyridin, piperidin, quinolin, isoquinolin, oxyquinolin, pyrrol, and in some cases with nicotin. The authors believe this arises from the formation of sulphonic acid derivatives and their resistance to decomposition. The Gunning-Arnold method gives more reliable results with pyridin when heated for a considerable period after the solution has become clear. Sodium sulphate can not be substituted for potassium sulphate.

The nitrogen distribution of fibrin hydrolyzed in the presence of ferric chlorid, C. A. MORROW and W. R. FETZER (*Soil Sci.*, 5 (1918), No. 2, pp. 163-167).—Duplicate analyses of the products of fibrin and fibrin plus ferric chlorid hydrolyzed in the presence of hydrochloric acid were made for the purpose of determining the effect on the distribution of the nitrogen in the hydrolysate of an iron compound such as might be present in mineral soils.

The results of the analyses showed that in the presence of ferric chlorid there is a substantial increase in ammonia nitrogen due to deamination of some amino acids at the temperature of hydrolysis, and that the acid-soluble humin nitrogen increases at the expense of a corresponding loss in the filtrate from the bases. This refutes the earlier conclusion of one of the authors (*E. S. R.*, 37, p. 517), that the humin nitrogen precipitated by calcium hydroxid is of nonprotein origin. A part of this acid-soluble humin is of protein origin, possibly coming from one amino acid.

The authors conclude that the results have an important bearing on the application of the Van Slyke method to soil analysis, and that data obtained by this method can not in any way represent the distribution of protein nitrogen in the soil.

The estimation of potash in kelp and similar substances by means of perchloric acid (*Chem. Trade Jour.*, 61 (1917), No. 1597, pp. 553, 554).—This

article reports a critical study of the perchlorate method of determining potash, depending upon the insolubility of potassium perchlorate in alcohol containing 0.2 per cent of perchloric acid. The method as modified consists of treating the sample with boiling hydrochloric acid to decompose the sulphids, precipitating the sulphates by solid barium hydroxid, and filtering under pressure. The potassium is then precipitated by perchloric acid in the usual way, and the potassium perchlorate is washed with 100 cc. of perchlorized alcohol.

The identification and estimation of zinc in water, R. MELDRUM (*Chem. News*, 116 (1917), Nos. 3028, pp. 271, 272; 3030, pp. 295, 296; 3031, pp. 308-310).—The methods investigated and discussed are (1) the film test which is considered reliable to the extent of 1 part of zinc in 200,000 parts of hard water containing calcium bicarbonate, (2) a colorimetric ammonium sulphid process sensitive to 1 part of zinc in 100,000 but of value only when the character and mineral constituents of the sample are known, and (3) a colorimetric ferrocyanid process sensitive to 1 part of zinc in 1,000,000 if a similar zinc-free water is available as a standard. The methods are described in detail.

The gasometric determination of combined carbonic acid, W. MESTREZAT (*Ann. Chim. Analyt.*, 23 (1918), No. 3, pp. 45-47, fig. 1).—The method described is applicable to the determination of combined carbonic acid in alkaline hypochlorite solutions used as antiseptics and depends upon the fact that oil of turpentine rapidly absorbs chlorin and various gaseous chlorin derivatives but does not absorb carbon dioxide.

To 10 or 20 cc. of the chlorinated solution 1 cc. of oil of turpentine and a sufficient quantity of 2 N sulphuric acid are added. The chlorin is absorbed by the oil of turpentine and the carbon dioxide collected in a eudiometer.

A color reaction for the examination of flour, especially for the determination of the grade of sifting, E. CALENDOLI (*Ann. Ig. [Rome]*, 28 (1918), No. 2, pp. 76, 77).—The method consists of adding a pinch of flour to a few cubic centimeters of concentrated hydrochloric acid. A color is produced which is violet if no bran is present but which becomes reddish brown in the presence of bran. By comparison with a set of standard colors an approximate valuation of the grade of flour can be made.

Quantitative colorimetric determination of pentosans in flour, G. TESTONI (*Staz. Sper. Agr. Ital.*, 50 (1917), No. 2, pp. 97-108).—The method consists of hydrolyzing the pentosans of the flour at a temperature of from 45 to 50° C. by a mixture of 90 parts of glacial acetic acid and 10 parts of concentrated hydrochloric acid to which has been added a little phloroglucin. The solution is then diluted with 100 times its volume of water and the pentoses estimated by colorimetric comparison with a standard prepared from arabinose with phloroglucin. By hydrolyzing at the temperature given, danger of hydrolysis of the hemicellulose is prevented.

The method is considered by the author to be superior to the official Tollens method with which it is compared.

Italian tomato products, S. LUIGI and D. FILIPPO (*Ann. Ig. [Rome]*, 28 (1918), No. 3, pp. 117-130).—This article reports the results of systematic analyses of tomato products. These include microscopic investigations and the determination of water, ash, sodium chlorid, toxic and antifermentative substances, and acidity of canned tomato soup, tomato sauce, and single, double, and triple concentrations of tomato juice.

Numerical data of a large number of analyses show that in a genuine tomato product, whatever its concentration, the percentage of ash is approximately one-tenth that of the dried extract. The acidity of the product does not follow a constant rule with relation to the amount of dry extract, as much depends upon the purity of the fruit and the method of preservation. The author sug-

gests that the price of various tomato products should be based upon the amount of dry extract normally contained in that type of product.

Arsenic in sulphured food products, W. D. COLLINS (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 360-364, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 13, p. 1400).—The methods of analysis used in obtaining the data previously noted (E. S. R., 38, p. 9) are described in detail.

The value of the Walker method for determining casein in milk, A. AGRESTINI (*Stat. Sper. Agr. Ital.*, 50 (1917), No. 2, pp. 109-114).—A comparison of the Walker method (E. S. R., 31, p. 114) with other methods of determining casein in milk is reported. It is suggested that if the milk to be examined is fresh and does not give an acid reaction toward litmus, the approximate percentage of casein contained in it can be found by determining the acidity of the milk by neutralization with $\frac{N}{10}$ potassium hydroxid, using phenolphthalein as an indicator and multiplying the value found by the factor 4.17, which is the average result of a number of determinations of the ratio casein: acidity. The Walker reaction should be used in the estimation of casein in milk with a decidedly acid reaction.

A comparison of the reductase tests with other recent sanitary milk tests, C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 141 (1917), pp. 32; *K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 2, pp. 85-114; *abs. in Chem. Abs.*, 11 (1917), No. 17, pp. 2511, 2512).—The reductase test, previously noted (E. S. R., 29, p. 206), is compared with the direct count method, the determination of ammonia in the milk, and the alizarin alcohol test noted by Morres (E. S. R., 22, p. 414). The author concludes that at the present time the reductase test is the safest and most convenient method to use.

The reductase test for milk, P. S. ARUP (*Analyst*, 43 (1918), No. 502, pp. 20-31).—This is a study of the relative influence of various factors on the accuracy of the reductase test for milk (E. S. R., 29, p. 206). The principal change recommended in the technique of the test is the reduction of the temperature from 38 to 28 or 29° C. This avoids errors of underestimation in raw milk, which is likely to contain organisms whose activity is impaired at the higher temperature, and of overestimation in pasteurized milk, since the organisms surviving pasteurization are probably more active at the higher temperature. The period of time should be increased if the test is carried out at the lower temperature.

The method is considered to afford a reliable means of distinguishing between good, bad, and indifferent milk and of checking the efficiency of pasteurization.

The determination of glucose in cane molasses, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill.*, 34 (1917), No. 10-12, pp. 312-327).—The author describes a method of determining glucose in cane molasses after fermentation of the molasses for from 72 to 84 hours. As the result of the investigations reported the conclusions are drawn that glucose does not exist in the juice of the sugar cane, but that it is the result of the action of a slight alkalinity, under the influence of heat, on the levulose which is present in all cane juice in variable proportions and which is found in large amounts in the final molasses.

The nonrelation between the purity of sugars and filtration of the sirups prepared for refining, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill.*, 35 (1917), No. 7-9, pp. 183-186; *abs. in Chem. Abs.*, 12 (1918), No. 9, p. 1008).—The author discusses the filtration of sugar solutions and states that there is no relation between the purity value or "titrage" of sugars and the rapidity of filtration of sirups prepared from them. Beet sugar gives sirups which filter more readily than sugar-cane sirups. The rapidity of the filtration of the latter

depends upon the mode of extraction of the sugar and the process followed in purifying the juices obtained.

A short handbook of oil analysis, A. H. GILL (*Philadelphia and London: J. B. Lippincott Co., 1918, 8. ed., rev., pp. 209, figs. 14*).—The changes in the eighth edition of this handbook, previously noted (*E. S. R., 22, p. 12*), include a description of the new MacMichael viscosimeter and a means of the reduction of viscosimetric readings to absolute units or poises. One or two minor tests for lubricating oils have been added. The special tests, methods of analysis, and the description of the special oils and greases have been revised where necessary, particularly in the case of the drying oils, and the methods of analysis of edible and hardened fats and oils included.

The precipitin test for blood, L. HERTOEN (*Jour. Amer. Med. Assoc., 70 (1918), No. 18, pp. 1273-1278, figs. 2*).—The precipitin test for blood is discussed primarily from the medicolegal point of view. The methods in use for the production of precipitin serum and for strength and specificity tests of the serum are described. Directions are given for the preparation of material for the precipitin test and for the technique of the test. Factors that may interfere with the reaction are discussed, and other uses of the test and special methods for the differentiation of blood of closely related animals are suggested.

A new method of determining chlorids in blood, M. DUGABDIN (*Ann. Chim. Analyt., 23 (1918), No. 3, p. 59*).—The method is as follows:

Ten cc. of the serum is treated with an equal volume of a 20 per cent solution of trichloroacetic acid to precipitate the proteins. After stirring and filtering, 10 cc. of the filtrate is heated with 15 cc. of $\frac{N}{10}$ silver nitrate. To this are added 25 cc. of distilled water, 5 cc. of nitric acid, and 5 cc. of a 10 per cent solution of iron alum, and the excess of silver is titrated with $\frac{N}{10}$ potassium sulphocyanid in the usual way. As trichloroacetic acid sometimes contains free hydrochloric acid or chlorids, a correction determination should be made.

A method for detecting small quantities of chloretone (trichlorotertiary-butyl alcohol) in aqueous solutions, T. B. ALDRICH (*Jour. Biol. Chem., 34 (1918), No. 2, pp. 263-267*).—The water solution of chloretone is distilled with steam and the distillate boiled for one-half hour, using a reflux condenser. The chloretone crystallizes in fine needles in the condenser. The method is said to be certain for less than 1 mg. of chloretone and may be used in the presence of other substances, such as oils, fats, acids, salts, etc., thus lending itself admirably to the detection of the drug in the fluids and tissues of the body. Organic solvents, however, dissolve chloretone and prevent its recognition by this method.

Survey of tanning materials in the Belgian Congo, E. NIHOUL (*Bul. Agr. Congo Belge, 8 (1917), No. 3-4, pp. 312-319, figs. 2*).—This article includes a description of the methods commonly employed in the determination of tannin, practical details on the analysis of tannins by the method of the International Association of Tannery Chemists, and directions for the gathering and preservation of samples of tanning materials.

The quantity and nature of the unfermentable sugar of cane molasses, H. PELLET (*Bul. Assoc. Chim. Sucri. et Distill., 35 (1917), No. 7-9, pp. 178-182; abs. in Chem. Abs., 12 (1918), No. 9, p. 1007*).—After fermentation with yeast under favorable conditions of temperature, acidity, and concentration, from 1 to 2 per cent of the total sugar of beet molasses and from 4 to 8 per cent of the sugar of cane molasses remain unfermented. This is in agreement with the

report of Peck and Deerr (*E. S. R.*, 21, p. 578). The unfermentable sugar is considered to be glucose.

Concord grape juice: Manufacture and chemical composition, B. G. HARTMANN and L. M. TOLMAN (*U. S. Dept. Agr. Bul. 656 (1918), pp. 26, fig. 1*).—This publication reports a study of the manufacture and chemical composition of commercial Concord grape juice. Suggestions are given for the proper handling and storage of the grapes, and the various steps in the process of juice manufacture are described in detail.

Tables are given of the composition of the juice at the time of storing and after four months' storage. The data show that there is a substantial decrease in solids during storage, about one-half of which is accounted for by the precipitation of cream of tartar and earth alkali tartrates, and the other half by the precipitation of pectin bodies and gums. There is a definite decrease in nonsugar solids, total acids, total tartaric acid, and alkalinity of the ash. There is no material change in the sugar content of the juice.

The analyses of 104 commercial juices from six different factories indicated that, if properly prepared, a Concord grape juice contains less than 0.4 per cent of alcohol by volume and no sucrose. It contains free tartaric acid, cream of tartar to the extent of about 0.54 gm. per 100 cc., and about 0.5 gm. of free malic acid per 100 cc.

The canning of fruit and vegetables (*Bd. Agr. and Fisheries [London], Food Prod. Leaflet 34 (1918), pp. 12*).—This pamphlet gives general directions for the home canning of fruits and vegetables.

Home canning and drying of vegetables and fruits (*Washington: Nat. War Garden Com., 1918, pp. 31, figs. 49*).—This manual contains detailed instructions for canning and drying vegetables and fruits, with directions for making jellies and fruit butters and for fermentation, salting, and pickling.

Drying as a method of food preservation in Hawaii, M. O. JOHNSON (*Hawaii Sta. Ext. Bul. 7 (1918), pp. 31, figs. 4*).—The principles and methods of drying are discussed in their relation to Hawaiian conditions. The construction and use of a homemade air drier of 150 to 200 lbs. capacity are described. Results are given of experiments in drying the banana, taro, cassava, sweet potato, edible canna, and Irish potato. Tables are given of the proximate analyses of taro, cassava, and sweet potatoes; the comparative yields and costs of flours prepared from various raw materials; and a comparison of analyses of wheat flours and proposed substitutes for flours.

Of the various wheat flour substitutes, flour made from the cassava root appears the most promising as being the finest, whitest flour with the lowest cost of production.

Split pea production and industry (*Bul. Dir. Gén. Agr., Com. et Colon., Tunis, 21 (1917), No. 92, pp. 185-188*).—In this article are described the processes employed in Tunis in the preparation of three varieties of split peas: (1) Evaporated split "petits pois," (2) ordinary split peas, and (3) malted split peas. For the first variety, young, fresh peas are dried in an evaporator before being decorticated, for the second, mature, dried peas are used, and for the third, the peas undergo a preliminary malting process to increase the sugar content.

Influence on linseed oil of the geographical source and variety of flax, F. RABAK (*U. S. Dept. Agr. Bul. 655 (1918), pp. 16*).—During two successive seasons four selected varieties of flax were grown in widely separated localities having different soil and climatic conditions. The oil was extracted from the seeds thus obtained and the color, specific gravity, index of refraction, acid, saponification, and iodine values, and drying power determined. Ether extraction was used to determine the actual yield of oil in the seeds, and

the method of cold expression to obtain samples for the determination of physical and chemical constants.

The analytical data, which are reported in tabular form, led to the following conclusions: Varieties of flax possessing agronomic differences also differ in both the physical and chemical properties of the oils. These properties are maintained to a marked degree from season to season. The yields of oil were found to vary with the variety of flax as well as with the locality. The specific gravity, index of refraction, and color can not be so easily correlated with variety or locality. Oils combining high acidity with high specific gravity and a relatively high iodine number dry to a firm film most rapidly. The lightest colored oils invariably possess the most rapid drying properties.

Toluol from spruce turpentine, A. S. WHEELER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 359, 360).—This is a preliminary report of experimental work with spruce turpentine to obtain toluene and cymene by the Friedel-Crafts reaction with benzene and aluminum chlorid. By fractional distillation samples were obtained which were easily converted into trinitrotoluene, thus indicating the possibility of utilization of spruce turpentine as a source of toluene (E. S. R., 38, p. 810).

METEOROLOGY.

Monthly Weather Review (*U. S. Mo. Weather Rev.*, 46 (1918), Nos. 1, pp. 54, pls. 9, figs. 6; 2, pp. 55-113, pls. 17, figs. 8).—In addition to weather forecasts, river and flood observations, and seismological reports for January and February, 1918; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during January and February, 1918; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 1.—Mathematical Theory of Sound Ranging (illus.), by H. Bateman; Mean Values of Free-air Barometric and Vapor Pressures, Temperatures, and Densities Over the United States, by W. R. Gregg; The Turning of Winds with Altitude, by W. R. Gregg; Halo of January 10, 1918, at Boulder, Colo., by O. C. Lester (abs.); Diffraction of Light in the Formation of Halos, by S. W. Visser (reprinted abs.); Horizontal Oscillation of the Free Atmosphere up to 10 km., at Batavia, by W. van Bemmelen and J. Boerema (reprinted abs.); Early Use of Kites in Military Operations, by Co-Ching Chu (abs.); Air Chimneys of Ice Below a Waterfall (illus.), by R. E. Horton; Cyclones, Tornadoes. Thunderstorms, Squalls, by A. J. Henry; Determination of Ozone and Nitrogen Oxids in Southern India, by F. L. Usher and B. S. Rao (reprinted abs.) (see p. 210); Pitfalls of Meteorological Periodicities, by W. W. Bryant (reprinted); Relation Between Barometric Pressure and the Water Level in a Well at Kew Observatory, by E. G. Bilham (reprinted); Phenomena Connected with Turbulence in the Lower Atmosphere, by G. I. Taylor (reprinted); Swiss Society of Geophysics, Meteorology, and Astronomy; Lawrence Hargrave, 1850-1915, by R. Greig-Smith; and Frank Plummer, 1868-1918, by G. N. Salisbury.

No. 2.—Nocturnal Radiation Measurements (illus.), by H. H. Kimball; Molecular Scattering of Light, by C. Fabry (reprinted); Partial Correlation Applied to Dakota Data on Weather and Wheat Yield, by T. A. Blair (see p. 210); Nomenclature of the Unit of Absolute Pressure, by C. F. Marvin; United States Daylight-saving Act of March 19, 1918; Diagrams Showing Conditions and Effects of the Daylight-saving Act, by C. F. Marvin; "Summer Time" and the British Meteorological Office, by N. Shaw (abs.); "Summer

Time" or Daylight Saving in Other Countries; Rainfall of 1917 in the British Isles (reprinted) (see below); Weather and Honey Production, by L. A. Kenoyer (E. S. R., 37, p. 854); and Former Weather Bureau Official in Naval Reserve Flying Corps.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and A. L. CHANDLER (*Massachusetts Sta. Met. Buls.* 351-352 (1918), pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1918, are presented. The data are briefly discussed in general notes on the weather of each month.

Partial correlation applied to Dakota data on weather and wheat yield, T. A. BLAIR (*U. S. Mo. Weather Rev.*, 46 (1918), No. 2, pp. 71-73).—Continuing previous work (E. S. R., 33, p. 117), the method of partial correlation was applied in the study of the relation between May and June rainfall and the yield of spring wheat in the Dakotas. The conclusions reached were as follows:

"The precipitation of May and June and the temperature of June are important factors, but not the only important factors, affecting the yield of wheat in the Dakotas. A considerable part of the apparent effect of either precipitation or temperature upon yield is really due to the accompanying effect of the other. In North Dakota the influence of precipitation is greater than that of temperature, while the reverse is true in South Dakota. When the precipitation of May and June is above the average in the Dakotas the temperature of June is generally below the average, and inversely."

The rainfall of 1917 [in the British Isles] (*Symons's Met. Mag.*, 52 (1918), No. 624, pp. 133, 134; *abs. in Nature* [London], 100 (1918), No. 2520, p. 472; *U. S. Mo. Weather Rev.*, 46 (1918), No. 2, p. 78).—It is stated that the rainfall of 1917 in the British Isles was about normal, although there were large areas of deficient rainfall in different parts of the country, especially in the center, part of the north, and the southwest of England, as well as the east midlands of Scotland, the southern half of Ireland, and the extreme north and south of Wales, the deficiency in these areas varying from 10 to 20 per cent of the normal. "Unusually wet regions included the west and north of Scotland, the north of Ireland, the Yorkshire Wolds, Cardigan Bay, and the London district. August, October, and November showed a general excess of rainfall over the country. May was rather wet in Ireland and June in England, especially locally. February and December were unusually dry, and there was on the whole a general deficiency of rainfall during the first seven months of the year."

The determination of ozone and oxids of nitrogen in the atmosphere, F. L. USHER and B. S. RAO (*Jour. Chem. Soc. [London]*, 111 (1917), No. 658, pp. 799-809, fig. 1; *abs. in U. S. Mo. Weather Rev.*, 46 (1918), No. 1, p. 25).—A modification of Rothmund and Burgstaller's method is described and the results of examinations of samples of air by the method are reported.

Of the 14 complete determinations made, 12 showed no ozone, hydrogen peroxid, or nitrogen peroxid. In two cases nitrogen peroxid was observed to the extent of 1 part in from 4,000,000 to 5,000,000 of air. The results indicate that ozone and nitrogen peroxid never occur together in the atmosphere.

SOILS—FERTILIZERS.

Reconnaissance soil survey of the San Diego region, Cal., L. C. HOLMES and R. L. PENDLETON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils*, 1915, pp. 77, pls. 4, fig. 1, map 1).—This survey, made in cooperation with the

California Experiment Station, deals with the soils of an area of 2,036,480 acres in the extreme southwestern corner of the State comprising the western two-thirds of San Diego County, together with small parts of Riverside and Orange Counties. The topography of the area is predominantly mountainous, with a belt along the western margin consisting of an elevated, dissected coastal plain. This plain attains elevations of from 500 to 600 ft. above sea level, while the mountain peaks and ridges rise to 3,000 and 4,000 ft. with a maximum elevation of 6,515 ft. Numerous flat-bottomed basins or small valleys occur among the mountain ranges. The valley areas, table-lands, and lower uplands are well drained, while the mountainous regions have excessive drainage. The area is characterized by a wet winter and dry summer. The mean annual rainfall varies from less than 10 in. in certain places along the coast to over 35 in. in some of the elevated inland situations.

The soils of the area are described as residual, from consolidated rocks; as coastal plain and old valley-filling material, from old unconsolidated water-laid deposits; and as recent alluvial, occurring as alluvial fans in the valleys and mountain basins. Rough stony land and rough broken land occupy 50.5 and 7.7 per cent, respectively, of the total area. In addition to these nonagricultural materials, 30 soil types of 18 series are mapped, exclusive of small areas of tidal marsh and coastal beach and dune sand. The region is prevaillingly one of brown soils of sandy loam texture, the Sierra sandy loams and Holland sandy loams occupying 9 and 7.5 per cent, respectively, of the total area.

Soil survey of Hillsborough County, Fla., C. N. MOONEY, T. M. MORRISON, G. B. JONES, E. C. HALL, and N. M. KIRK (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 42, fig. 1, map 1*).—This survey deals with the soils of an area of 668,800 acres in the west-central part of the Florida Peninsula, Tampa Bay extending well into the county from the southwest. The topography of the area varies from level to rolling and hilly, with tidal marshes bordering the bay, beyond which is a wide belt of low coastal flatwoods ascending gradually toward the interior. The flatwoods area is poorly drained, and the uplands are marked by the absence of surface streams. The higher interior section, however, is drained by several large streams and their tributaries.

Most of the soils in the county were derived from unconsolidated marine sediments washed from the Piedmont Plateau. In addition there are areas of alluvial, residual or partly residual, and cumulose soils. Ten soil types of 9 series are mapped, besides swamp, water and grass, tidal marsh, muck, peaty muck, made land, and shell mounds. Leon fine sand, Norfolk fine sand, and Portsmouth fine sand predominate, occupying 31.3, 19.9, and 18 per cent of the total area, respectively.

Soil survey of Brooks County, Ga., A. T. SWEET and B. W. TILMAN (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 42, pls. 5, fig. 1, map 1*).—This survey, made in cooperation with the Georgia College, deals with the soils of an area of 305,920 acres in south-central Georgia lying wholly within the Coastal Plain region. The prevailing topography of the county consists of low, broad ridges and almost level areas, but in many places low, well-rounded hills occur, and a few flat, depressed areas. The drainage is generally well established.

The soils of the county, which are of Coastal Plain origin, are derived from unconsolidated sediments of late geological age and are all sandy in character, ranging from medium or coarse in the western or northern parts to fine and very fine in the southeastern part. Considerable alluvium has been deposited along the larger streams, with the development of terraces in some places, in addition to overflow first bottoms. Seventeen soil types of 10 series are

mapped, exclusive of swamp. Norfolk sandy loam and Ruston sandy loam predominate, occupying 24.1 and 14.8 per cent of the total area, respectively.

Soil survey of Eastland County, Tex., W. G. SMITH, J. H. AGEE, W. I. WATKINS, and W. A. ROCKIE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 37, fig. 1, map 1*).—This survey deals with the soils of an area of 595,200 acres in central Texas. "The northern third of the county includes rather deeply cut and steep-sided valleys, with more or less rough and hilly intervening upland areas. Over the remainder of the county the valleys are less deeply carved and are bordered by more gentle slopes, and the interstream uplands include more extensive areas of level to gently sloping and rolling land. Second bottoms or terraces occur inextensively in more or less detached bodies along the principal streams. Overflowed first bottom lands are more extensively developed, but occur in strips of very irregular width." The elevation of the area ranges from 1,250 to 1,750 ft. above sea level. The streams of the county are small and largely intermittent.

The soils of the county include those residual from sandstone, shale, and conglomerate, and from limestone; those derived from outwash-plain or valley-filling material; and those of recent alluvial origin. Fifteen soil types of 7 series are mapped, in addition to rough stony land. Windthorst fine sandy loam and Nimrod fine sand predominate, occupying 18.4 and 17.7 per cent, respectively, of the total area.

Soil survey of Taylor County, Tex., W. G. SMITH, A. E. KOCHER, R. F. ROGERS, and W. I. WATKINS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 40, figs. 2, map 1*).—This survey deals with the soils of an area of 581,120 acres lying just northwest of the center of the State. Remnants of the Edwards Plateau form a strip of country of very irregular outline, from 2 to 16 miles wide, comprising a little more than one-fourth of the area of the county. The elevation of these plateaus is from 200 to 300 ft. above that of the general level of the county, which has an approximate elevation of from 1,750 to 2,000 ft. The surface topography of the plateaus varies from level to gently rolling, and that of the remainder of the county from gently rolling to nearly level. Drainage is complete.

The soils of the county are derived directly as residual soils or indirectly as stream bottoms, terraces, and terrace plain soils from limestone, shale, sandstone, and conglomerate rocks. Twenty-six soil types of 9 series are mapped, exclusive of rough stony land. Clay loams, silty clay loams, silty clays, and clays occupy about 45 per cent of the county, and loams, fine sands, and fine sandy loams about 27 per cent. The remaining area comprises stony and gravelly lands.

Soil survey of Jefferson, Berkeley, and Morgan Counties, W. Va., W. J. LATIMER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 74, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the State Geological Survey, deals with the soils of an area of 492,160 acres in the extreme eastern part of the State lying wholly within the Appalachian Valley region. Topographically the area consists of a series of narrow mountain ridges rising abruptly from rather broad and fairly smooth intervening valleys. The valleys range from 500 to 800 ft. above sea level, and the mountains from 1,000 to 1,500 ft. above the valleys. The area is drained mainly by the Potomac River and its tributaries, and drainage is generally well established.

The soils of the area are chiefly residual in origin, being derived from the sedimentary rocks consisting of limestone, shale, and sandstone. Soils of the River Flood Plains province occur along the streams, and consist of old alluvial and recent alluvial deposits. Twenty-five soil types of 13 series are mapped in addition to rough stony land. Hagerstown silt loam, Dekalb shale loam,

and rough stony land predominate, occupying 17.7, 17, and 11 per cent of the total area, respectively.

Studies on capacities of soils for irrigation water and on a new method of determining volume weight, O. W. ISRAELSEN (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 1, pp. 1-36, pl. 1, figs. 14).—This is an account of work done in connection with a study of the economical duty of water for alfalfa in the Sacramento Valley, Cal., which was carried on from 1910 to 1915 as a part of the cooperative irrigation investigations of the U. S. Department of Agriculture, the State Department of Engineering, and the California Experiment Station.

Observations on the capacities of certain kinds of soils under different conditions to retain water are reported and the "relation between the depth of water necessary to add a given percentage of moisture to a certain depth of soil of given volume weight is expressed mathematically and graphically. The observations of capacity of soils to retain water are based on 9,584 moisture determinations in the upper 6 ft. of soil, 672 in the depth from 7 to 9 ft., and 192 in the tenth to twelfth foot sections, making 10,448 in all. Volume-weight determinations upon which the pore-space values largely depend and by which the percentages of water were converted to inches of water per foot of soil were made upon the soils in place to a depth of 6 ft.

"The observations indicate that the percentages of pore space which are filled by the water that a soil holds immediately after irrigation increase with the increase in fineness of soil texture. Variations from 40 per cent in silt-loam soils having fine sandy-loam subsoils, 51 per cent in silt loams, 58 per cent in clay loams, to 66 per cent in the clay soils have been noted. The ratio of the maximum capillary capacities of soils, as determined in a 10-in. tube in the laboratory, to that of the same soils observed in the field after irrigation varied from 1.78 ± 0.06 to 1.98 ± 0.14 . Correlations between the moisture equivalent and the maximum amounts of water found after irrigation show a gratifying agreement and suggest that the moisture equivalent might be made a basis of judging maximum capillary capacities.

"A new method of determining volume weight of soil in place which is simple of manipulation and inexpensive is described." In this method the volume of the auger hole made in taking soil samples to a depth of 6 ft. was measured by inserting a very thin-walled elastic rubber tube into the hole and filling it with water from a graduated cylinder. Laboratory volume-weight determinations were made upon the soil removed from the hole, as follows: "Brass tubes 2 in. in diameter and 10 in. long were filled with thoroughly pulverized air-dry soil on the Bowman compactor. The weight of the soil was corrected for hygroscopic moisture, and the volume of the tube was computed and also determined by filling it with water." A comparison of the volume weights obtained by the two methods showed wide variations. The volume weight of a clay soil was decreased nearly 23 per cent by being disturbed while that of a fine sandy loam was increased 15 per cent.

"The most striking factor brought out by the study of the volume weight of the soil in place . . . is the fact that the coarse-textured soils have in general much lower volume weights than the fine-textured ones, a relation just the reverse of that which is generally believed to exist between texture and volume weight. . . . The results of the new method of determining the volume weight of clay-loam soil, as checked by a paraffin-immersion method first used by Charles F. Shaw and by the use of an iron tube, were subject to an error of less than 1 per cent."

A list of 12 references to literature cited in the article is given.

. Relation of the mechanical analysis to the moisture equivalent of soils, A. SMITH (*Soil Sci.*, 4 (1917), No. 6, pp. 471-476).—A further contribution to the study of the relation between the moisture equivalent and the mechanical analysis of soils, based on experimental results obtained in the laboratory of the division of soil technology, University of California. The moisture equivalent for 12 different soil types, ranging in texture from coarse sand to clay and in origin from residual to recent alluvial, was determined by use of the centrifuge designed by Briggs and McLane (*E. S. R.*, 19, p. 416), and a mechanical analysis made by the Bureau of Soils method, special care being exercised in the separation into the seven groups of soil particles.

All of the particles of the same group were combined, and the moisture equivalent for each composite group of soil separates determined, the moisture equivalent varying from 1.18 per cent for fine gravel to 61.03 for clay. Specific-gravity determinations were also made for each group and were found to vary from 2.64 to 2.69, indicating that the mechanical analysis gave seven grades of soil material which differed mainly in the size of the particles constituting any one group, and not in any marked variation in mineral content. It is concluded from the results of these determinations that "to use the mechanical analysis as an indirect method for the calculation of the moisture equivalent, the investigator must give to each textural grade a definite and distinct value and not disregard the sands, or group three or four grades into one."

Three synthetic soils were made up from the grades of soil particles representing loam, sandy loam, and fine sandy loam, and the moisture equivalent for each was determined. In comparing the values obtained with those calculated for these soils from the values for the moisture equivalent as determined for each separate, it was found "that the calculated moisture equivalent is practically the same as the determined when separate values are given to the seven individual grades of texture, and not when determined by totaling the five grades of sand or disregarding the sands and just considering the silt and clay content of a soil."

Further mechanical analyses and moisture equivalent determinations of various types of soil are briefly discussed and are said to have shown wide variations between the calculated and the determined moisture equivalents. The author maintains "that one formula will not hold in all cases, if that formula is calculated by means of least squares as was done by Briggs and McLane [*E. S. R.*, 19, p. 416; 26, p. 421] or by direct determination of the moisture equivalent for the various separates, as was tried in this laboratory. One factor . . . overlooked by most investigators has been the influence of the shape of the soil particles on the moisture retentiveness of soils or on their moisture equivalent. . . .

"It was thought at first . . . that it would be possible to have one formula to be used for residual soils, another for 'wind-laid,' another for recent alluvial, etc., which might take care of the shape of the soil particles. When one, however, sees how the surface soil of residual origin . . . has the same mechanical analysis as the subsoil of the same origin and yet a considerably lower moisture equivalent, while on the other hand, a recent alluvial surface soil has the same mechanical analysis as its subsoil yet a considerably higher moisture equivalent, it is evident that any suggested formulas for calculating a constant such as the moisture equivalent from the mechanical analysis of soils are far from accurate. . . .

"From the data given it is felt that while the moisture equivalent calculated from the mechanical analysis according to the formulas suggested gives approximate results, nevertheless they are far from accurate for scientific work,

and it will be necessary to make an actual moisture equivalent determination for satisfactory results."

The moisture equivalent determinations of salt-treated soils and their relation to changes in the interior surfaces, L. T. SHARP and D. D. WAYNICK (*Soil Sci.*, 4 (1917), No. 6, pp. 463-469, fig. 1).—The authors present experimental data obtained in a study of the effects upon the physical properties of Davis clay-loam soil of adding different concentrations of sodium salts, including the chlorid, sulphate, carbonate, hydroxid, nitrate, and acetate, and of calcium chlorid; and of removing the salts by washing with distilled water, as indicated by moisture-equivalent determinations. A theoretical conception of the comparative magnitudes of the interior surfaces of soils based upon the moisture equivalent is also presented, the thesis being that "the optimum physical conditions for plant growth in such heterogeneous mediums as the soil mass must obviously depend in some measure upon the interfaces between the various phases and the factors affecting them."

Duplicate 100-gm. portions of soil passed through a 2-mm. sieve were treated with 80 cc. of the various salt solutions. The salts were washed from a portion of the soils before centrifuging and the moisture equivalent determined by the method described by Briggs and McLane (*E. S. R.*, 19, p. 416). The soil treatments and moisture equivalents obtained are presented in tabular form. In discussing the results it is stated that "on the whole, it can be said that while the added salts are present in the soil, little or no change in the moisture equivalent was observed. A very different effect is produced if these same salts are washed from the soil with water. The soils so treated seem to possess a new and peculiar set of physical properties."

The moisture equivalent of the Davis soil was markedly increased by such treatments, the extent depending upon the salt used. The washing out of all the sodium salts was accompanied by a considerable increase in the moisture equivalent, while the washing out of calcium chlorid did not perceptibly alter this factor. "Since the leaching out of other salts as potassium chlorid, potassium sulphate, potassium nitrate, and ammonium sulphate produces an effect quite similar to that existing after the sodium salts have been leached from the soil, it is highly probable that the washing out of the salts first mentioned would produce effects on the moisture equivalent commensurate with those found when sodium salts have been leached from the soil. The amount of change in the moisture equivalent due to leaching seems to depend also upon the anion with which the sodium is associated. In the experiment reported sodium sulphate produced the greatest effect, followed in order by sodium hydroxid, sodium carbonate, and sodium chlorid. . . .

"The absolute quantity of salt with which the soil has been treated is likewise an important factor in determining the extent to which the soil will be modified. The larger applications followed with washing of salts invariably produced the greater effects on the moisture equivalent. The two smaller applications of sodium carbonate and sodium hydroxid were without a measurable effect."

The authors conclude "that the salt and water treatments have increased the interior surface of the soils from 2 to 40 per cent, the magnitude of the increase depending upon factors which have already been mentioned. The salts alone have not measurably affected the interior surface."

The treatment of alkali soil, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1916, pp. 17, 18*).—The plan of treatment of an alkali soil, comprising tile drainage and applications of gypsum and manure, as undertaken in 1914 is outlined. Sweet clover and alfalfa were seeded on the plats in 1915, and the first crop was harvested in 1916. All

treatments gave increased yields over the checks, but the effect of the different treatments is not deemed comparable, due to the variability of the soil. Sweet clover outyielded adjacent plats of alfalfa in every case.

Soil acidity as influenced by green manures, J. W. WHITE (*Jour. Agr. Research* [U. S.], 18 (1918), No. 3, pp. 171-197).—From the results of pot experiments at the Pennsylvania Experiment Station with various leguminous and nonleguminous plants and some common weeds and less desirable grasses applied to a distinctly acid soil both in the fresh and air-dry condition, the conclusion is drawn "that fresh green manures plowed under on this acid silty loam soil reduce its acidity very soon after plowing under, but finally leaves a soil of increased acidity. Also that nitrification goes on in them quite vigorously under suitable moisture, temperature, and aerative conditions and that the green manured soils are rich in nitrates, despite the soil acidity. As to the cause of the increased acidity, beyond showing that it is not largely due to nitrification and indicating that it is in some way associated with the added organic materials or their fermentative residues, the experiments furnished little definite information."

The changes taking place during the storage of farm-yard manure, E. J. RUSSELL and E. H. RICHARDS (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 495-563, figs. 10).—The investigations here reported "began in an attempt to account for the loss of nitrogen that occurs during the cultivation of land rich in organic matter or liberally supplied with farmyard manure," as observed, for example, in the Rothamsted plats. As the work progressed, however, it was extended to "deal with the changes in the manure heap independently of their bearing on the changes within the soil." It has included laboratory experiments, investigations on the changes which go on in manure in the stable and in the heap, and studies of the relationship between composition and crop-producing value of manure. A comparative study was also made of changes which take place in the purification of sewage and those occurring in the decomposition of manure.

There was found to be a complete parallel between the decomposition of sewage and manure and a close resemblance between these and the laboratory decomposition of protein. It is concluded "that the decompositions in all cases start in the same way. Under strictly anaerobic conditions they remain the same, but under aerobic conditions further reactions, notably formation of nitrate and loss of nitrogen, set in both in sewage and in manure heaps, which mask the general similarity with the degradation of protein as it has been studied in the laboratory."

Special methods and apparatus used to prove that the loss of nitrogen observed is due to the escape of free nitrogen are described. It was found, however, that under completely anaerobic conditions there was no loss of nitrogen although there was a breaking down of complex nitrogen compounds to ammonia, the accumulation of which was greater at 26° C. than at 15°. Neither was there any loss of nitrogen under completely aerobic conditions. Loss of nitrogen due to the escape of free nitrogen occurred only under mixed aerobic and anaerobic conditions which occur when air diffuses in the manure. The experiments showed that nitrification takes place in the manure heap in the presence of air and in the absence of much moisture. It was always observed on the outside layer when drying had occurred, but was never found in the lower depths that had remained moist.

In laboratory experiments under anaerobic conditions it was found that as much as 17 per cent of the dry matter of the manure may be converted into gas. In the heap the proportion is less. The nonnitrogenous constituents, particularly, are affected, as much as one-quarter of the pentosans disappear

ing during the process and other constituents breaking down in like proportion. The gas evolved contained carbon dioxide, marsh gas, and hydrogen. Under aerobic conditions the loss of dry matter was greater and the temperature higher than under anaerobic conditions. The gases involved contained no hydrogen or marsh gas.

The authors conclude that the practical aims in the management of manure, namely, to secure as much dry matter and ammonia and as little loss of nitrogen as possible, are not attained in manure heaps however well put up. "It appears that the heap is at best an imperfect method of storage, but that its defects are lessened by keeping it compact and sheltered, where it will neither be washed by rain nor suffer too much loss on drying, and in particular by avoiding summer storage."

The method of leaving manure under the animals in stalls or covered yards until it is wanted is thought to be the best that can be suggested with our present knowledge. "If the manure has to be stored it should be under anaerobic conditions, and if possible at a temperature of about 26°."

Many analyses of manure from various sources are compiled from which the following averages are deduced:

Average composition of different kinds of manure.

Kind of manure.	Total nitrogen.	Ammo- niacal nitrogen.	Amid nitrogen.	More complex nitrogen com- pounds.	Phos- phoric acid (P ₂ O ₅).	Potash (K ₂ O).
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Bullock.....	0.62	0.12	0.08	0.42	0.26	0.72
Cow.....	.43	.09	.03	.29	.19	.44
Horse.....	.54	.13	.04	.34	.23	.54

The historical development of scientific knowledge regarding the decomposition and preservation of manure is reviewed.

Soil fertility work on county experiment farms, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 101-103).—This presents a brief preliminary report of the results of fertilizer tests conducted during 1916 and 1917 along the same general lines as previously noted (E. S. R., 36, p. 829). The conclusion was reached that on the older soils of Ohio acid phosphate could be used to good advantage. High yields were also obtained with potash and nitrogen fertilization, but at present prices the use of these materials is deemed to be unprofitable for the average farmer.

Buying commercial fertilizers, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 139-141).—Tabulated data obtained from the fertilizer experiments noted above are presented to show the total and net value, after deducting the cost of the fertilizer, of the increased yield of crops produced by 100 lbs. of acid phosphate when used alone, when used with muriate of potash, and when used with both muriate of potash and nitrate of soda.

The results are held to indicate that with the present condition of the fertilizer market the purchase of carriers of phosphorus such as acid phosphate, steamed bone meal, and basic slag is alone justified.

A study in farm drainage, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 107-110).—Fertilizer and manurial experiments with corn, soy beans, wheat, and clover grown in rotation on impoverished drained and undrained land in Clermont County, Ohio, are said to indicate that phosphorus, potassium, nitrogen, lime, and drainage are all required for profitable crop production on

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these soils. With manure as the carrier of nitrogen and potassium, on the basis of cost of application only, the cost of the phosphorus and lime and nearly one-half that of the drainage has been recovered at values based on prewar prices of fertilizers and crops, while at values based on estimated present prices the entire outlay was recovered, together with a considerable margin of profit.

The nitrogen problem and the work of the Nitrogen Products Committee (*Jour. Soc. Chem. Indus.*, 36 (1917), No. 22, pp. 1196-1200; *Nature* [London], 100 (1917), No. 2512, pp. 316-318; *Metallurg. and Chem. Engin.*, 18 (1918), No. 2, pp. 77-81).—This is a preliminary report of the British committee which was organized in June, 1916, to consider the nitrogen problem especially from the standpoint of war needs and to outline plans for increasing the production of nitrogen compounds. It deals especially with plans which are under consideration for increasing the recovery of by-product ammonia and for producing cyanamid and utilizing the ammonia oxidation and synthetic-ammonia processes under Government aid and auspices.

The effect of different salts on ammonia formation in soil, G. P. KOCH (*Jour. Biol. Chem.*, 31 (1917), No. 2, pp. 411-413; *abs. in Jour. Chem. Soc.* [London], 112 (1917), No. 660, I, p. 622).—Investigations at the New Jersey Experiment Stations are reported which show that "utilizing various combinations of MgSO_4 , K_2SO_4 , and $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$, and controlling the concentration at two atmospheres, the following effects on ammonia formation from dried blood in soil were obtained: (1) In combinations of the salts where $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ was present in only 0.1 of the total concentration a considerable increase in ammonia formation was apparent. (2) When 0.8, 0.9, or all of the total concentration was supplied by $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ the ammonia formation was approximately 26 per cent greater than when no salts were added to the soil. (3) MgSO_4 and K_2SO_4 singly or in combination were toxic where no $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ was added in the combination."

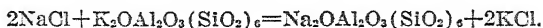
Several references to literature bearing on the subject are given.

Nitrate of soda in 1917 (*Chem. Trade Jour.*, 62 (1918), No. 1601, pp. 67, 68).—The nitrate situation during and at close of the year is briefly reviewed. It is stated that the production of Chilean nitrate was 2,949,300 tons in 1917 as compared with 2,865,300 tons in 1916. The shipments during 1917 to Europe (including Egypt) amounted to 1,048,000 tons, and to the United States and other countries 1,684,000 tons. It is estimated that the stocks in Chili December 31, 1917, amounted to 882,000 tons. The increased activity in production and export during the year is ascribed to the high price and great demand from munitions factories. The price of the nitrate was almost prohibitive of its use as fertilizer.

Bibliography on the extraction of potash from complex mineral silicates, E. C. BUCK (*Metallurg. and Chem. Engin.*, 18 (1918), Nos. 1, pp. 33-37; 2, pp. 90-95).—This bibliography includes a full list of references to patents and periodical literature relating especially to the sintering of phosphatic rocks with feldspars, but also to other methods and processes applicable to feldspars, leucite, and glauconite (greensand marl).

A neglected chemical reaction and an available source of potash, E. A. ASHCROFT (*Chem. Trade Jour.*, 61 (1917), No. 1596, pp. 529-531; *Sci. Amer. Sup.* 85 (1918), No. 2216, p. 390).—This article, which is an abstract of a paper discussed at a meeting of the Institution of Mining and Metallurgy in London, calls attention to the fact first discovered by Bassett that, "if any common variety of orthoclase or microcline feldspar be dry crushed to 100 mesh in an iron mill and mixed with its own weight of pure dry common salt, and then

heated to from 900 to 1,000° C. for two hours out of contact with air or moisture or furnace gases carrying such air or moisture, . . . the sodium base of the salt displaces the potassium base of the feldspar strictly according to the equation:



"If the temperature has not exceeded 1,000° C., and if moisture and air have been carefully excluded, the product will be found to consist of finely divided insoluble sodium feldspar (albite) and a mixture of quite neutral and freely soluble sodium and potassium chlorids. These chlorids may be readily lixiviated in water, and are easily separated from each other by fractional crystallization. The extraction of potash obtainable by this means from a sample of feldspar carrying upward of 10 per cent K_2O will be in the neighborhood of 85 per cent under the conditions above stated. There is no loss by volatilization, and the weights of residue and salt will be found to correspond with the equation."

The practical application of this reaction in the preparation of potash salts from feldspar is discussed and experiments with the process are reported. An emergency process suited to present conditions is described. The author holds that "all consideration of by-products in such schemes should be a secondary thought and should not form an essential part of the scheme."

Sources of potash, T. E. THORPE (*Nature* [London], 100 (1918), No. 2514, pp. 344-347; *Sci. Amer. Sup.*, 85 (1918), No. 2198, p. 103).—This article deals especially with the Bassett-Ashcroft process of preparing potassium chlorid from feldspars (noted above), but also briefly describes the Stassfurt, Alsatian, Spanish, and Abyssinian deposits of potash salts. Attention is called to the fact that "conditions such as probably have produced the Stassfurt deposits are still at work and may be observed in several parts of the world operating over large areas, as, for example, in the Adji-Daria Bay, in the east of the Caspian Sea. . . . None of these areas has been investigated with such care as that of the North German plain, but the general conditions which have led to their production are seen to be similar, although local circumstances, especially the extent to which they were subjected to an intermittent influx of sea water, have modified the nature, relative amounts, and distribution of their various saline constituents."

Italian leucitic lavas as a source of potash, H. S. WASHINGTON (*Metallurg. and Chem. Engin.*, 18 (1918), No. 2, pp. 65-71).—In this article "attention is called, as a future possible source of potash, to the leucitic lavas of seven volcanoes along the west coast of Italy from Bolsena to Vesuvius. The rock types are characterized and the several volcanoes described succinctly. The volumes of the volcanoes, the tonnage of the lavas, the percentage of potash, and the total (minimum) amount of potash at each are calculated. It is shown that the leucitic lavas of these volcanoes, with an average potash content of about 9 per cent, contain at least 8,786,200,000 metric tons of K_2O , making them the greatest accumulation of highly potash-rich silicate rocks known. Methods of extraction of the potash are not discussed."

Recovery of potash from greensand, H. W. CHARLTON (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 1, pp. 6-8; *Amer. Jour. Sci.*, 4. ser., 45 (1918), No. 266, p. 142).—This deals with a process which was originally developed for the treatment of feldspar for the extraction of potash but which has been found to apply more advantageously to greensand or glauconite.

"The process consists in heating the finely ground mineral under pressure with water and lime in autoclaves. Steam at a pressure of about 225 lbs.

is led directly into the digester and this is maintained for a period of two to four hours. Although glauconite contains less potash than feldspar, it has been found that it is decomposed more readily than the latter, and that it yields potassium hydroxide that is nearly pure. It is proposed to utilize the waste material obtained by filtration from the potash solution for making bricks, tiles, and similar articles, as it has been found that when mixed with sand, pressed, and steam hardened it makes durable products."

Sources of potash, H. MAXWELL (*Nature* [London], 100 (1918), No. 2516, p. 384).—Discussing the value of bracken fern as a source of potash, analyses are reported which show that the sample of air-dried fern examined contained 4.82 per cent of ash, of which 41.5 per cent was potash; that is, the dried fern itself contained about 2 per cent of potash. The ash contained in addition small quantities of phosphoric acid.

Kelp industry in British Columbia (*Jour. Soc. Chem. Indus.*, 36 (1917), No. 13, p. 710; *abs. in Chem. Abs.*, 11 (1917), No. 23, p. 3368).—This is a brief note on the operations of a plant established at Sydney, B. C., in 1915, for the production of potash and algin. The plant is now utilizing from 30 to 40 tons of raw kelp daily in the manufacture of fertilizer, the product being a fine, dry, but heavy powder. It is believed that the manufacture of potash and iodine, without the production of by-products, would not prove profitable in normal times. It is estimated that the kelp beds on the coast of British Columbia contain sufficient material to supply not only the local requirements for potash but some for export.

The value of phosphates on Indiana soils, A. T. WIANCKO and S. C. JONES (*Indiana Sta. Bul.* 210 (1918), pp. 16, figs. 4).—Field tests with different phosphates conducted during the past 12 years on 5 experimental farms representing different soil types found in the State have led to the following conclusions:

Acid phosphate has given the best results, with basic slag and steamed bone meal next in order of profitableness. Rock phosphate gave good results in certain cases, but showed the least profit. In immediate returns on the first and second crops after application, acid phosphate has yielded crop increases of from 3 to 25 times as much as those obtained from rock phosphate. Neither acid nor any other phosphate used increased soil acidity or the need for liming, although Indiana soils needing phosphorus are deemed generally to be in need of lime also.

Based on the results obtained, recommendations for soil improvement are briefly outlined, and include a systematic rotation of crops, liming, drainage, manuring, and the application of from 150 to 200 lbs. per acre of acid phosphate or some other readily available phosphate to each grain crop in the rotation.

Indiana soils need phosphates, A. T. WIANCKO and S. C. JONES (*Indiana Sta. Circ.* 79 (1918), pp. 8, figs. 3).—This presents in a condensed and popular form the results of the work noted above.

The relative value of limestone of different degrees of fineness for soil improvement, J. W. WHITE (*Pennsylvania Sta. Bul.* 149 (1917), pp. 3-24, figs. 11).—This bulletin reports the results of both laboratory and greenhouse experiments to determine the relative value for soil improvement of high calcium and magnesium limestone ground to pass 100, 60, 20, and 8 mesh screens, respectively, the finer material in each case being excluded, except from the 100-mesh grade, as compared with equivalent amounts of the burned products. The studies were made during the period 1915 to 1917, inclusive, and embraced observations upon the solubility of the different grades in pure and carbonated water; upon their relative value in correcting soil acidity and in the formation

of nitrates; upon the lime requirements of the soil at three periods of the experiment; upon the rate of decomposition of the different grades of limestone; upon the alkali-soluble humus and total nitrogen recovered from soil treated with 100-mesh limestone as compared with burned lime treatment; and upon the effect on the growth of red and crimson clover, wheat, oats, soy beans, hairy vetch, Canada field peas, sweet clover, Hungarian millet, and Grand Rapids lettuce. Soil from the ammonium sulphate plats of the general fertilizer experiment was used and showed a lime requirement at the beginning of the experiment of 3,220 lbs. of calcium carbonate per acre 7 in. The results are presented in tabular form and fully discussed.

The total increased yield of crops from the high calcium burned lime and limestone was 537.21 gm., as compared with 518.13 gm. for the magnesian lime and limestone, indicating very little difference in the value of the two limestones for crop production. The relative value of the different grades of limestone for soil improvement, represented in their percentage relation to the highest value as 100, were as follows:

Relative value of limestone particles.

Kind of factor.	100 mesh.	60 mesh.	20 mesh.	8 mesh.
Solubility in carbonated water.....	100	57	45	28
Value in correcting acidity.....	100	57	27	18
Formation of nitrates.....	100	94	56	12
Growth of plants.....	100	69	22	5

The burned lime and the 100-mesh limestone gave an alkaline soil the first year, with a slight acidity at the end of the third year. High calcium 60-mesh stone gave an alkaline soil the second year, and the 20-mesh at the end of the third year. The 60-mesh magnesian stone produced an alkaline soil after 3 years, while the 20-mesh showed a lime requirement of 1,288 lbs. for the same period. Applications of the 8-mesh grade showed lime requirements after 3 years of 3,017 lbs. for high calcium stone and 3,051 lbs. for magnesian stone.

The rate of decomposition of the limestone at the end of 3 years was ascertained by means of determinations of the total carbonates in the soil and was found to be as follows:

Decomposition of the limestone in 1915, 1916, and 1917.

Degree of fineness.	High calcium stone.		Magnesian stone.	
	Per cent.	Pounds per acre.	Per cent.	Pounds per acre.
100 mesh.....	92.4	8,689	91.2	8,584
60 mesh.....	81.5	7,671	72.2	6,790
20 mesh.....	46.7	4,393	34.9	3,290
8 mesh.....	14.9	1,307	5.97	562

The decomposition of the limestone in the soil as determined by the acidity corrected was found to bear a close relation to the residual limestone as determined by the increased carbon dioxid content.

"On the basis of the data accumulated on the behavior of the varied-sized limestone particles when incorporated in an acid soil, it may be concluded that an application of limestone in which the entire product consists of very fine

material is less desirable than one consisting of varied degrees of fineness. The increased cost of the very finely ground limestone, together with the rapidity with which it disappears from the soil as compared with coarser material, leads to the conclusion that an application of material all of which will pass a 10-mesh screen and include all of the fine material incident to such grinding is sufficiently fine for soil improvement if applied somewhat in excess of the immediate need of the soil. The crop to which limestone should be applied will depend upon the proportion of fine material. In a rotation of corn, oats, wheat, and grass, the limestone, if finely ground, should be applied to the wheat, while in the case of a coarser grade of limestone, the application should be made to the corn or oats, and this allows time for the coarser particles to come into play previous to the clover seeding."

The relative value of limestone of different degrees of fineness for soil improvement, J. W. WHITE and F. D. GARDNER (*Pennsylvania Sta. Bul.* 152 (1918), pp. 16, figs. 7).—This bulletin presents in a condensed and popular form the investigations noted above.

Gypsum as a fertilizer, O. NOLTE (*Jour. Landw.*, 65 (1917), pp. 67-73; *abs. in Jour. Chem. Soc. [London]*, 112 (1917), No. 660, I, p. 624).—The literature of this subject is discussed, and the following conclusions are drawn:

Gypsum acts on the soil by means of both of its constituents, double decomposition occurring with the mineral compounds of the soil. Owing to its ability to undergo hydrolytic decomposition into acid and base, it influences the reaction of the soil especially by virtue of the constituent with the predominating reaction, that is, the sulphuric acid. Consequently, as far as possible, gypsum should not be used with acid and physiologically acid fertilizers, and in particular should never be applied to acid soils. On the other hand, it acts favorably in conjunction with physiologically basic salts, as it removes or weakens the basic reaction resulting from plant growth, and so assists in the retention of a loose texture by the soil. Gypsum may be employed with advantage when there is a shortage of such physiologically active fertilizers as potassium sulphate and chlorid, superphosphate, and ammonium sulphate."

The sulphuric acid situation in the United States, L. B. SKINNER (*Metal-lurg. and Chem. Engin.*, 18 (1918), No. 2, pp. 82-85).—The situation is quite fully reviewed, and the conclusion is reached that in the future "the general trend will be to relegate acid manufacture to those engaged in the metallurgical industry [and that] there will be a gradual decline in the practice of pyrites-burning, and incidentally brimstone, for the express purpose of making sulphuric acid."

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures, C. S. CATHCART ET AL. (*New Jersey Stas. Bul.* 314 (1917), pp. 4-51).—This reports the actual and guaranteed analyses of 228 brands of complete fertilizers, 234 brands containing nitrogen and phosphoric acid, 16 home mixtures, and 137 samples of fertilizing materials including nitrate of soda, sulphate of ammonia, dried blood, dried and ground fish, crude fish, fish and tankage, tankage, acid phosphate, and basic lime phosphate. A total of 635 analyses is reported.

AGRICULTURAL BOTANY.

Textbook of botany, C. E. ALLEN and E. M. GILBERT (*Boston: D. C. Heath & Co.*, 1917, pp. X+459, pls. 8, figs. 223).—This book is planned to furnish a secondary school course in botany continuing throughout the school year, but suggestive courses are also outlined to start at different times and continue for shorter periods. Laboratory and field work is provided. Chapters or parts

thereof deal with bacteria, fungi, forestry and forest management, plant breeding, and plant diseases.

Note on a method of demonstrating the heat of respiration, M. C. POTTER (*Ann. Bot. [London]*, 31 (1917), No. 123-124, pp. 435-438, fig. 1).—A method is described of demonstrating the heat of respiration, with modifications thereof for different purposes.

Relative transpiration as a measure of the intrinsic transpiring power of the plant, R. C. KNIGHT (*Ann. Bot. [London]*, 31 (1917), No. 123-124, pp. 351-359).—Experimentation testing the comparative evaporation from atmometers and shoots of *Eupatorium adenophorum* is claimed to have shown that only when the wind velocity is constant does relative transpiration, using this term as it was first employed by Livingston (E. S. R., 18, p. 328), give a satisfactory measure of the intrinsic transpiring power of the plant.

The applicability of Weber's law to phototropic reaction by *Phycomyces nitens*, JOHANNA S. A. WISSE (*De geldigheid der wet van Weber voor de phototropische reactie van Phycomyces nitens. Proefschr., Univ. Groningen, 1916*, pp. 67+3, pl. 1, figs. 2).—The agreements and disagreements with Weber's law as noted in tests on the phototropism of *P. nitens* are indicated with discussion.

Studies in permeability.—V, The swelling of plant tissue in water and its relation to temperature and various dissolved substances, W. STILES and I. JØRGENSEN (*Ann. Bot. [London]*, 31 (1917), No. 121-123, pp. 415-434, figs. 9).—Having continued the series of studies previously noted (E. S. R., 37, p. 632), the authors describe a method for investigating the passage of water between the vegetable cell and its surroundings. This method is quantitative, permitting investigation of the kinetics of the changes which occur. The probable error and means of reducing it are indicated.

Carrot roots and potato tubers absorb water for some days, after which equilibrium is maintained for a considerable time. Swelling is greater in case of the carrot. In both, the previous history of the tissue influences greatly the amount of absorption, which is also affected by different solutes and their concentration, by temperature, and by toxic action on the cells. The bearing of these and other facts presented on some theories of permeability is discussed.

Permeability of the cell walls of *Allium*, S. C. BROOKS (*Bot. Gaz.*, 64 (1917), No. 6, pp. 509-512).—The author states that in the course of studies with onion bulb scales, employing a modification (which is described) of the method used in the work previously noted (E. S. R., 39, p. 26), he found that the exterior cell wall of the epidermis from the inner surface of onion bulb scales is slightly permeable to hydrochloric acid but practically impermeable to various salts, dyes, and sodium hydroxid. It is thought necessary to consider the influence of impermeable cell walls in interpreting data on the permeability of plant tissues.

Notes on osmotic experiments with marine algæ, R. H. TRUE (*Bot. Gaz.*, 65 (1918), No. 1, pp. 71-82).—Notes are given on work, so far as completed, on osmotic pressure in cells of marine algæ.

Studies on osmotic values in Alpine plants, J. MEIER (*Mitt. Naturf. Gesell. Freiburg*, 3 (1916), No. 3, pp. 101-167, fig. 1).—The results are given in considerable detail of studies carried on in 1911 to 1913 at Fribourg, Switzerland, relating to the osmotic values of the saps in various portions of different plants in several environments under varied conditions of weather, season, and geological situation; or, more particularly, the relation between osmotic pressure and such factors as situation (exposure), habit of growth, wind, precipitation, sunshine, snow covering, and temperature.

The extraction of sap from plant tissues by pressure, R. A. GORTNER, J. V. LAWRENCE, and J. A. HARRIS (*Biochem. Bul.*, 5 (1916), No. 20-21, pp. 139-142, pl. 1).—The authors, applying the modifications employed by Gortner and Harris (*E. S. R.*, 31, p. 221) of the methods of Dixon and Atkins, as previously reported (*E. S. R.*, 29, p. 828), have been able to substantiate, except in minor points, the conclusions of these authors, showing that samples of sap pressed from unfrozen tissues can not be taken as typical of the original concentration of the juices in the tissues. They have been able also to extend somewhat the results reported by these authors.

The pentose sugars in plant metabolism, H. A. SPOEHR (*Plant World*, 20 (1917), No. 12, pp. 365-379).—In a report of results (which are tabulated with discussion) of investigations on the carbohydrate content of *Opuntia* sp. as related to age, season, and such conditions as water content and starvation (by being kept in the dark), the author states that the salient feature of these experiments is the observation that pentose sugars accumulate only under conditions of low water content, though but little light is thrown on their origin. The problem is regarded as very complex.

The course of carbohydrate consumption during starvation is considered to throw some light on the utilization of various sugars. The proportions of these to each other maintain a surprising regularity as depletion proceeds, hexose and pentose sugars being consumed at about the same relative rates.

Anthocyanins, W. C. DE GRAAFF (*Chem. Weekbl.*, 15 (1918), No. 5, pp. 122-140).—This is a review of studies bearing upon the constitution, distribution, and significance of anthocyanins in plants.

Resin secretion in *Balsamorhiza sagittata*, E. C. FAUST (*Bot. Gaz.*, 64 (1917), No. 6, pp. 441-479, pls. 4, figs. 2).—Summarizing the principal facts developed during a study undertaken to determine the origin of the secretory tissue and the cause and significance of resin secretion in *B. sagittata*, the author states that inulin, a polysaccharid produced during photosynthesis, is broken down, giving as a by-product balsamoresene. This resene may be changed to resinic acid. Both these products are supposed to be toxic to the plant and to be translocated to schizogenously formed ducts where they are stored in the form of resinic acid.

The relation between acids and bases in vegetable tissues, G. ANDRÉ (*Bul. Soc. Chim. France*, 4. ser., 31 (1917), No. 11, pp. 258-271).—Data which are presented in tabular form, as obtained from a study of the percentages of such different substances as bases, acids, salts, and nitrogen present at different stages in the growth and maturity of *Hordeum vulgare*, *Linum usitatissimum*, *Camelina sativa*, *Carthamus tinctorius*, *Nigella damascena*, and *Spergula arvensis* showed an excess of nitrogen as compared with the amounts considered as accounted for in the intake of the plant.

Organic plant poisons.—I, Hydrocyanic acid, WINIFRED E. BRENCHEY (*Ann. Bot. [London]*, 31 (1917), No. 123-124, pp. 447-456, figs. 3).—Having extended the studies previously noted (*E. S. R.*, 33, p. 327) to the effects of dilute hydrocyanic acid, the author reports that no trace of stimulation of either peas or barley was obtained with hydrocyanic acid or any of the compounds employed in the work previously reported. Prussic acid was very toxic to both these plants, giving effects which are described. Concentrations of 1:100,000 killed peas immediately or after a short period of poor growth. Barley subjected to 1:100,000 solution made a very slight growth after a period of arrest. This plant was killed by all strong concentrations. Formic acid was comparatively harmless to barley except in very strong concentrations, but sodium cyanid was as toxic as is prussic acid itself.

Poisoning tree parasites with cyanid of potassium, M. M. METCALF (*Science*, n. ser., 47 (1918), No. 1214, pp. 344, 345).—The author reports that in the spring of 1915 he bored half-inch holes in each of six apple and pear trees, filled the holes with powdered chemically pure potassium cyanid, and then covered them up. Four of the trees were apparently dying from scale, and the other two were infested but not dying. During the summer all six trees became free from scale and the four dying ones began to recuperate. In the fall both the apple and the pear trees bore good fruit. After an interval of three years, all of the trees are reported as healthy and vigorous, with no areas of dead bark around the inoculation holes.

The above facts are believed to indicate that inoculation with potassium cyanid, if the chemical is used without admixture with other substances, is not necessarily injurious to apple and pear trees. The effectiveness of the treatment is said to be doubtful, however, as the scale died on other trees which were not inoculated.

Parasitism of seeds which are toxic or rich in essential oils, V. GALIPRE (*Comp. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 14, pp. 432-436).—The author has pointed out in a previous communication (*E. S. R.*, 35, p. 244) the prevalence of parasites in seeds of a considerable number of plants, and has extended these studies to seeds of several plants which contain toxic substances or essential oils. He states that such seeds do not present an exception to the rule regarding the presence of parasites in seeds, which is suspected to hold throughout a wide range of plant forms.

The application of photochemical temperature coefficients to the velocity of carbon dioxid assimilation, W. H. BROWN and G. W. HEISE (*Philippine Jour. Sci., Sect. C*, 12 (1917), No. 1, pp. 1-25, figs. 3).—The results of the analysis of the work of various investigators are considered as remarkably consistent and as justifying the statement that carbon dioxid assimilation shows coefficients varying from 1 to 1.4 over long ranges of temperature favorable to that process. The coefficients are much smaller than those required by the van't Hoff law, being of the same order of magnitude as photochemical coefficients.

The relation between light intensity and carbon dioxid assimilation, W. H. BROWN and G. W. HEISE (*Philippine Jour. Sci., Sect. C*, 12 (1917), No. 2, pp. 85-97, figs. 2).—Continuing their study on the same plan as that above noted, the authors state that a review of the literature on photosynthesis does not lead to the conclusion which is commonly drawn therefrom, namely, that carbon dioxid assimilation by plants is proportional to light intensity, but that it really indicates a progressively smaller augmentation in the rate as intensity increases until the point is reached at which no measurable increase is produced by further increase in illumination.

The controlling influence of carbon dioxid.—IV, On the production of secondary dormancy in seeds of *Brassica alba* following treatment with carbon dioxid, and the relation of this phenomenon to the question of stimuli in growth processes, F. KIDD and C. WEST (*Ann. Bot. [London]*, 31 (1917), No. 123-124, pp. 457-487, pls. 2, fig. 5).—The object of this work was to discover the controlling causes of the condition previously noted by Kidd (*E. S. R.*, 35, 821) and designated by Crocker (*E. S. R.*, 36, p. 330) as secondary dormancy consequent upon unusual accumulation of carbon dioxid in seeds, particularly those of *B. alba*, kept in high concentrations of that gas.

It is stated that secondary dormancy is due neither to increased mechanical restraint of the seed coats nor to decreased permeability of the coats to gases, but that it is due to a stable condition of the embryo tissue, which becomes slowly established during the period of primary dormancy, induced by the

concentrated carbon dioxid. This condition is thought to be comparable to that of mature organs or of embryos maturing on the parent plant. A definite stimulus producing a change in the state of the tissue equilibrium is required for the initiation of growth after such inhibition. In case of dormant white mustard this may be brought about by various treatments, which, when carried too far, produce injury and may result fatally to the embryo.

Acacia seedlings, II, R. H. CAMBAGE (*Jour. and Proc. Roy. Soc. N. S. Wales*, 50 (1916), pt. 1, pp. 143-164, pls. 4).—In studies continuing those previously noted (E. S. R., 35, p. 329), a seed of *A. farnesiana* was soaked for 405 days in sea water and then planted. After 5 weeks it was examined, placed in boiling water, replanted, reexamined after 9 weeks, and placed in boiling water, again replanted, and after five weeks it finally sprouted. Another seed sprouted after having been left in the soil for 23 months. It is stated that the softening of the coatings requisite to sprouting is often accomplished in nature by fires. Otherwise the seeds may remain unaffected in the soil for years and may be transported by water for thousands of miles before germinating.

Abscission of flowers and fruits in the Solanaceæ, with special reference to Nicotiana, J. N. KENDALL (*Univ. Cal. Pubs. Bot.*, 5 (1918), No. 12, pp. 347-428, pls. 5, figs. 10).—The author gives an account of studies regarding abscission in its various forms. He classes as direct factors bringing about abscission narcotic vapors, injury to floral organs, sudden rise in temperature, and lack of fertilization; and as indirect factors changes in soil conditions and factors evident in normal physiological development.

On the constancy of cell shape in leaves of varying shape, LILLIAN A. TENOPYR (*Bul. Torrey Bot. Club*, 45 (1918), No. 2, pp. 51-76, fig. 1).—The author describes a study of various plants which is said to confirm the conclusion reached by several authors named that the average cell size for any tissue of a species or variety is a fairly constant and hereditary character. The cell sizes of closely related species may be the same or may differ widely. The cell size in an organ may depend upon the stage of development of the plant at the time the organ is produced. Differences of leaf shape are not necessarily correlated with differences in cell shape. Leaf shape is due not to cell shape or differences therein, but probably to factors for periodically limiting the number and direction of the cell divisions in each type of leaf.

Oenothera lamarckiana considered as a nuclear chimera, J. P. LOTSX (*Arch. Néerland. Sci. Exact. et Nat.*, Ser. 3 B, 3 (1917), No. 2-3, pp. 324-350, pls. 6).—The author claims that on account of heterozygotism *O. lamarckiana* and its derivatives do not constitute material suitable for use in proving the existence of mutations. The extension of studies regarding the existence of nuclear chimeras to other genera, the cytological examination of nuclear chimeras, and the further study of heterogamy are regarded as highly desirable.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from January 1 to March 31, 1915 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 42* (1918), pp. 123, pls. 9).—This inventory (Nos. 39682 to 40388) includes considerable material collected by F. N. Meyer on an expedition which reached the capital of the Province of Kansu, China, as well as other introductions.

FIELD CROPS.

[Work with field crops on the Truckee-Carson reclamation project experiment farm in 1916], F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1916*, pp. 1-12, fig. 1).—This reports the

progress of work continued along the same general lines as previously noted (E. S. R., 36, p. 133), and includes a brief summary of weather conditions; a temperature survey of the project; notes on agricultural conditions on the farm; the results of variety tests with barley, wheat, corn, and potatoes noted below; and the results of fertilizer experiments with wheat grown in greenhouse beds, in which acid phosphate gave the best results, with barnyard manure next.

The leading barley varieties were Kents, with 1,916 lbs. per acre, and Coast, with 1,765 lbs., and with average yields for 1915 and 1916 of 1,676 and 1,903 lbs. per acre, respectively. Little Club was again the highest yielding wheat variety, with 52.2 bu. per acre and a 2-year average yield of 48.9 bu. All varieties of corn failed to mature seed. A total yield of 41,405 lbs. of silage corn was obtained from an area of 5.03 acres. Tests were made with 21 varieties of potatoes, and American Wonder, Pearl, Hundredfold, Early Ohio, Rural New Yorker No. 2, and Irish Cobbler were deemed best as regards uniformity in shape and size. Scotch Rose from California and Russet Burbank grown in a comparative test with Dietz selected Burbank produced about equally, while Scotch Rose from Oregon germinated poorly.

Report of the Harney Branch Experiment Station, Burns, Oreg., 1913-14, L. R. BREITHAUP (Oregon Sta. Bien. Rpt. Harney Sta., 1913-14, pp. 2-22, figs. 13).—This presents a brief history of the substation, with notes on the soil and climate, and includes a report on experimental work conducted during the period of 1912 to 1914, inclusive. The early work of the substation has already been described (E. S. R., 32, p. 131).

Tabulated data are presented showing marked increases in yields of different varieties of wheat, oats, barley, and potatoes grown on fallowed land in 1913 over the yields from the same varieties grown on nonfallowed land in 1912. Variety tests with winter and spring wheat, oats, barley, flax, field peas, and alfalfa grown during 1913, a favorable season, and 1914, a decidedly unfavorable season, are also noted. In crop rotation experiments, wheat after wheat gave a 2-year average yield of 8.5 bu. per acre, after peas 14.5 bu., and after fallow, 15.66 bu. In 1913, peas after wheat produced 9.5 bu., and after fallow, 15 bu. Winter wheat seeded at rates of 30, 45, 75, and 120 lbs. per acre during 1913 showed yields of 17.13, 14.5, 10.33, and 4.13 bu. per acre, respectively. In date-of-seeding tests made in 1914, Swanneck barley seeded April 20, May 6, and May 18 yielded 15.52, 11.04, and 6.63 bu. per acre, respectively; selected Bluestem wheat seeded April 18 and May 6 yielded 16.28 and 10.34 bu., respectively; and University No. 25 flax seeded April 20, May 10, and May 18 yielded 3.57, 5, and 1.78 bu. per acre, respectively.

Dry farming investigations at the Harney Branch Station, Burns, Oreg., L. R. BREITHAUP (Oregon Sta. Bul. 150 (1918), pp. 5-43, 46, figs. 16).—This bulletin reports the results of experimental work conducted at the substation during 1913 to 1917, inclusive, embracing variety tests with winter and spring wheat, rye, oats, barley, emmer, winter spelt, and flax; field peas, alfalfa, sweet clover, vetch, and other legumes; and with miscellaneous forage and root crops. Rotation, tillage, and date and rate of seeding tests with the principal crops of the region are also reported.

The most successful crops included early-maturing, hardy, drought-resistant varieties of wheat, rye, oats, and barley. Winter wheat and rye, alfalfa for seed, flax, field peas, and potatoes are described as partly successful, while corn, Sudan grass, millet, and all easily frosted, late-maturing, or nondrought-resistant crops failed. A discussion of some of the results obtained at the substation has already been noted (E. S. R., 37, p. 333), while information regarding the history, climate, soil, etc., is included in the bulletin noted above.

The yields reported in this bulletin were produced with an average annual precipitation of 8.67 in. and with frost-free periods ranging from 49 to 64 days.

Of 37 varieties of winter wheat tested, the Turkey type has given the highest yields, the 5 leading strains with their respective 4-year average yields being C. I. No. 1553 with 20 bu. per acre, C. I. No. 2223 with 18.9 bu., C. I. No. 2098 with 17.6 bu., Crimean with 17.1 bu., and Kharkov with 16.2 bu. Planting Turkey winter wheat March 20 and April 5 resulted in yields of 12.5 bu. and 2.2 bu. per acre, as compared with 28.9 bu. for the same variety sown in the fall and 23 bu. for Early Baart seeded April 20. Low germination due to a lack of moisture in the fall and late frosts in the spring has proved to be the principal limiting factor in winter wheat production.

Spring wheat is said to be the most consistent grain producer of any cereal grown on the substation. Talimka, Chul, and Prelude have always matured by August 15, while Early Baart, the highest-yielding variety, with a 5-year average yield of 21 bu. per acre, has matured in 4 of the 5 years in which it was tested. Owing to its high-yielding powers and superior quality, this variety is deemed best for central Oregon. Seeding spring wheat at 20, 30 to 35, and 60 lb. rates resulted in net increases obtained after deducting twice the amount of seed used from the average yield of 17, 16.1, and 13.9 bu. per acre respectively. Early Baart and similar varieties yielded best when sown as near April 10 as possible.

Utah winter Barley, the highest yielding variety, produced only 6.4 bu. per acre for a 4-year average. Seeded in the spring this variety made fair yields, but was quite inferior to the spring varieties. Hannchen, White Smyrna, and Coast with average yields of 26.3, 24.8, and 24 bu. per acre, respectively, are deemed the best spring barley varieties. Seeding rates of 24 to 30, 48 to 60, and 72 to 84 lbs. per acre showed average net increases of 20.8, 19.2, and 17.5 bu. per acre, respectively. The highest yields were obtained with seedings made about May 1.

Winter oats gave very low yields when seeded in the fall, and were inferior to spring oats when seeded in the spring. Rustless Selection, Silvermine, Kherson, Sixty Day, and Big Four (4-year average), with average yields of 34.2, 31, 30.7, 30.1, and 29.1 bu. per acre, respectively, were the most promising varieties. Seeding rates of 2, 4, and 6 pk. per acre have resulted in average net increases of 20.3, 19.9, and 19 bu. per acre, respectively. The middle of April is deemed the best time for seeding spring oats.

Winter rye appeared to be subject to the same limitations as winter wheat. Minnesota, the only variety to be tested each year of the 5-year period, produced an average yield of 8.9 bu. per acre, while, in 1917, Advance yielded 16.1 bu. Seeded early in the spring (March 20), winter rye yielded 14.8 bu., as compared with 17.5 bu. from a fall seeding of the same variety. Later seedings made April 5 and May 16 yielded 8.2 and 1 bu. per acre, respectively, as against 13.6 bu. from spring rye seeded May 16. The leading spring rye variety was S. P. I. No. 26101 with a 3-year average yield of 14.1 bu. per acre. Seeding about the middle of April at the rate of 45 lbs. per acre is deemed best.

The 4-year average yields of winter and spring emmer have been 15.6 and 18 bu. per acre, respectively. Tests with emmer have been discontinued. One variety of winter spelt was grown both as a fall and spring crop in 1915 and 1916, but the crop is not deemed suited to this region.

Primost flax, the only variety grown for 5 years, yielded 5.2 bu. per acre, and Nova Rossick, grown for 3 years, 7.3 bu. Seedlings made about May 1 at a 10-lb. rate have given the best results.

The Grimm, Baltic, Cossack, and Semipalatinsk strains of alfalfa proved to be most hardy, although practically all of the kinds tested are said to have shown little winterkilling. Baltic and Martin Acclimatized produced 5-year average

yields of 72 and 60.3 lbs. of seed per acre, respectively. Hay yields have averaged about 0.5 ton per acre. Spacing tests indicated that increased yields of both hay and seed might be obtained by proper care in this direction.

Field peas have been rather unsatisfactory, Clamort, the leading variety, yielding only 9.9 bu. per acre for a 4-year average. The average hay yield for all varieties was about 0.9 ton per acre. Hogging off field peas resulted in an average annual gain of 122 lbs. per acre for a 4-year period. In similar tests with sheep, an average gain of 128 lbs. was made for 2 years.

White sweet clover yielded at the rate of 1.7 tons per acre for 3 years, and is deemed superior to the yellow-flowered sort.

Lallemantia iberica, an oil seed plant, is said to be quite hardy, drought-resistant, and early. It yielded at the rate of 420 lbs. per acre.

In variety tests with potatoes, Nerted Gem and Six Weeks (Geer) with average yields of 46.9 and 46.0 bu. per acre were highest. Of the root crops tested the highest yield, 12.85 tons per acre, was obtained from Colossal Half-Sugar mangels.

The comparative yields and estimated acre values of leading varieties of the principal crops grown at the substation are presented in tabular form. The values ranged from \$6.75 for Black Winter emmer to \$18.90 for Early Baart spring wheat.

Rotation experiments, ranging from continuous cropping to 8-year rotations, are in progress, the crops used including winter and spring wheat, oats, barley, rye, flax, field peas, potatoes, sweet clover, and alfalfa. The results are deemed rather incomplete, but are held to indicate the necessity of bare fallow one year in two for profitable grain production. The highest yield of spring wheat, 15.9 bu. per acre, was obtained in a rotation with peas and fallow, while the fallow-wheat rotation produced 14 bu. The increased yield was offset, however, by a higher cost of production and a low yield of peas. Wheat grown continuously produced 7.4 bu. per acre.

Tests of methods of seed-bed preparation for wheat on summer fallow are said to indicate the importance of early spring preparation, immediate harrowing of early-plowed land, the eradication of weeds on fallow, and early spring plowing of stubble.

The so-called "slick spots" containing a slight excess of alkali and a deficiency of organic matter were somewhat improved by heavy applications of manure. Sweet clover also gave good results in reclaiming these areas. Alfalfa for seed, sown thinly and with a minimum of expense, has given fair returns.

[Summary report of State and cooperative experiment farms, 1915-16] (*Bien. Rpt. Bd. Farm Comrs. [Wyo.], 1915-16, pp. 3-99, pls. 10*).—A continuation of work previously noted (*E. S. R.*, 36, p. 33), reporting the results of numerous field tests with flax and with grain and forage crops at several centers in Wyoming with and without irrigation.

Dry farming methods in Mysore, A. K. YEGNA NARAYAN AIYER (*Agr. Jour. India*, 12 (1917), No. 3, pp. 425-435).—Dry-farming methods practiced in Mysore are discussed in detail. The author states that 5,000 000 acres, or over 80 per cent of the total area under cultivation, are dry farmed.

[Field crops work in India, 1915-16], C. A. BARBER and W. R. DUNSTAN (*Ann. Rpt. Bd. Sci. Advice India, 1915-16, pp. 70-93, 189-191*).—Experimental work conducted at various centers in India with green manures, weeds in cultivated land, miscellaneous fodder crops, rice, wheat, juar, sugar cane, cotton, oil seeds, gram, tobacco, and indigo is briefly reviewed, a large part of the investigations having been already reported in detail.

[Report on the field crops work of the department of agriculture, Bengal, 1916] (*Ann. Rpts. Expert Off. Dept. Agr. Bengal, 1916, pp. 1-78*).—This re-

ports the results of fertilizers, variety, and cultural tests with rice, jute, sugar cane, peanuts, and potatoes, and of field tests with miscellaneous fodder crops.

Annual report of experimental [field crops] work of the Agricultural station, Landhi, 1915-16, T. F. MAIN (*Dept. Agr. Bombay, Ann. Rpt. Agr. Sta. Landhi, 1915-16, pp. 12, pls. 2*).—Rotation experiments with potatoes and cotton and field tests with berseem, alfalfa, and numerous minor crops are briefly noted.

Electroculture: With brief account of some experiments conducted at Lincluden Mains, Miss E. C. DUDGEON (*Trans. and Jour. Proc. Dumfriesshire and Galloicay Nat. Hist. and Antiquarian Soc., 3. ser., 4 (1915-16), pp. 88-97*).—In continuation of work previously noted (E. S. R., 37, p. 336), the results obtained in field tests with potatoes and oats grown on electrified and non-electrified areas are briefly reviewed for 1912 to 1915, inclusive.

Barley seedlings, grown under control conditions in a greenhouse during the season of 1913-14, showed an excess of 41 per cent in dry weight for the electrified plants over the control plants.

Experiments with early vegetables to determine the effect of electric light upon plant growth are briefly noted and are said to indicate that germination was greatly accelerated, the seedlings showing such remarkable vigor that they could be set out in the open without the necessity of being hardened off.

The economic significance of the root development of agricultural crops, A. and G. L. C. HOWARD (*Agr. Jour. India, Indian Sci. Cong. No., 1917, pp. 17-28, pls. 2, figs. 5*).—The authors present experimental evidence based on observations of the root systems of flax, gram, wheat, *Hibiscus sabdariffa*, *H. cannabinus*, and Java indigo showing that soil aeration is responsible for a series of phenomena relating to crop production on the Indo-Gangetic alluvium.

A comparison of the root systems of different varieties of the same crop and of the various crops named showed a marked correlation between the root system and varietal characters, such as drought resistance, adaptability to high soil moistures during the monsoon period, etc., and to physical conditions of the soil.

On the study of the root system of cereal and forage plants, S. I. VOROB'EV (*Selsk. Khoz. i Lesov., 251 (1916), August, pp. 477-505; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 2, pp. 198-201*).—Experiments with roots are reported to determine the length, area of spread, depth of penetration, and maximum number of roots in kilograms per hectare. Special ditches were dug for daily observations of root growth and the results of the studies may be briefly summarized as follows:

The roots gradually decreased in volume as the plant increased in size. Root penetration was found to be dependent upon the soil type. Water absorption from the roots by the plant was most intensive at a level of 25 cm. (9.8 in.), less so at 50 cm., and disappeared entirely at 75 cm., the water content of the roots remaining constant. It was found that where the roots penetrated through certain well-defined layers of soil, as clay, black mold, or sand, it was necessary to estimate the absorption of water from the root by the soil as well as by the plant.

Investigations regarding the relationship between the length of roots and drought resistance are reported as indicating that the length of the roots themselves has little influence on the absorbent capacity of the root system, except for that portion abundantly covered with root hairs which develop freely in humid atmospheres.

Pasture and forage crops for south Mississippi, E. B. FERRIS (*Mississippi Sta. Bul. 180 (1917), pp. 32, figs. 7*).—This presents a rather comprehensive discussion of the present agricultural situation on the cut-over pine lands of

south Mississippi. The basis of successful farming in this region is said to be live-stock production, but the native grasses are regarded as inadequate, even with the extensive ranges available, and recommendations are made, therefore, relative to suitable grasses and legumes for pasture as indicated by experimental tests and field observations made at the McNeill substation over a period of years. Bermuda grass, carpet grass, and lespedeza have given the best results for summer pasture, while oats, rape, and bur, hop, and crimson clovers have proved best for winter and early spring. Climatic conditions being decidedly unfavorable for hay production, the use of the silo is deemed essential to success in live-stock feeding. Excellent crops of silage from corn and sorghum have been obtained. Velvet beans have proved to be a valuable forage crop for the small farm where a silo is impracticable. Soy beans are said to give much promise in this locality.

The grasses of Illinois, EDNA MOSHER (*Illinois Sta. Bul.* 205 (1918), pp. 425, figs. 285).—A monograph on the grasses of Illinois comprising an account of the structure of grasses, a key to the genera of Illinois grasses, and brief descriptions and notes on the distribution of the grasses found in the State. The author has listed 204 species representing 63 genera, 43 species being now recorded for the first time as occurring in Illinois.

A bibliography of 23 titles, including only those works in which the grasses of the State are mentioned, is appended.

[Fodder grasses of Nellore, India], C. TADULINGHAM and K. RANGA ACHARYA (*Madras Agr. Dept. Yearbook*, 1917, pp. 35, 36, 40-52, pls. 8).—The more important fodder grasses encountered in the Nellore District of the Madras Presidency, India, are described and illustrated.

In addition to the above, an undescribed species of *Cynodon* was noted which is said to be closely allied to *C. dactylon*. Observations revealed the fact that the grass previously identified as *Panicum crus-galli* was composed of two closely related species. Color variations in the flowers of *Pavonia procumbens* are also briefly noted.

Haymaking, H. B. McCURE (*U. S. Dept. Agr., Farmers' Bul.* 943 (1918), pp. 31, figs. 16).—This presents a rather detailed discussion of approved methods for handling hay, with particular reference to the best utilization of labor by the adoption of modern haying implements such as loaders, push rakes, and stackers. Schemes are outlined for employing various sized crews and acreages when loading is done by hand or with a loader, when the hay is stacked with push rakes and stackers, and when the crop is baled in the field from the wind-row. The nature of curing is briefly explained and the necessity for a systematic plan of haying operations emphasized.

Methods employed by successful hay growers are described and include the making of timothy and clover hay with a loader, and of irrigated alfalfa hay with push rakes and stackers, and the making and baling of prairie hay, and of alfalfa hay under unfavorable weather conditions.

[Cereal production in Chile], S. CUBILLOS VALDIVIESO (*An. Agron. [Santiago de Chile]*, 8 (1914), Nos. 2-3, pp. 149-272, pls. 4; 4, pp. 73-112).—A detailed account of the production of wheat, barley, and oats in Chile.

Résumé of the fiber-inspection work of the Bureau of Agriculture during the year 1916, M. M. SALEEBY (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 1, pp. 64-88).—The fiber-grading and inspection work in the enforcement of the fiber-grading and inspection law (E. S. R., 36, p. 634) is reported for 1916, with considerable tabulated data showing the production and exports of abacá and maguey in the Philippine Islands.

The total production of abacá in 1916 amounted to 1,174,663 bales, and of maguey (retted), 129,263 bales, as compared with a production of 1,011,366 and 59,940 bales, respectively, in 1915.

Inoculation of legumes, A. BONAZZI (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 161, 162).—A tabular statement is presented based on a compilation of data from various sources to show the results to be expected from cross-inoculations of 21 common cultivated or wild legumes.

Varieties of alfalfa seed, H. D. HUGHES (*Iowa Agr.*, 18 (1917), No. 4, pp. 163-165).—Field tests with a number of samples of alfalfa seed from various sections of this country and Europe have been in progress at the Iowa Experiment Station since 1910.

Practically no difference has been noted in the yield of hay from Dakota, Nebraska, and Kansas-grown seed, while Oklahoma-grown seed has not yielded quite so well as that produced farther north, and irrigated seed from Utah has been decidedly inferior. The imported seed has given very poor yields as compared with American-grown seed from any source. Nebraska- and Kansas-grown seed have proved to be practically as hardy as that from the Dakotas and Montana, although the latter has withstood severe winter tests much better than the former, while Oklahoma and Utah seed has been almost entirely winterkilled. Imported alfalfa has been hardy, showing less winterkilling under ordinary conditions than common commercial seed from any part of the United States.

The source of seed apparently had much less to do with the hardness than the particular strain or variety, although as a general rule northern-grown seed has been more hardy than southern-grown seed. Grimm alfalfa and related types, while not superior to the imported alfalfas in hardness, are deemed superior to them for Iowa conditions because of their high-yielding qualities, the possibility of securing four cuttings per season, and their vigorous fall growth.

Botanical studies of some beer barleys [in Italy] conducted during the year 1915-16, U. BRIZI (*Ann. Ist. Agr. [Milan]*, 13 (1915-16), pp. 147-169).—Tabulated data, showing the vegetative characters, yields, and malting values of 22 varieties and strains of barley, are presented and discussed. Similar data are presented for 5 varieties grown both as spring and winter barleys.

The chemical composition of some beer barleys produced in Italy, V. TRIVELLONI (*Ann. Ist. Agr. [Milan]*, 13 (1915-16), pp. 171-176).—The chemical composition of 45 varieties or strains of barley is outlined in tabular form and briefly discussed.

On the proteid substances of barley in the grain itself and during the brewing processes.—IV, Investigations as to malting power of various sorts of barley, H. SCHJERNING and JENNY HEMPEL (*Compt. Rend. Lab. Carlsberg*, 11 (1917), No. 6, pp. 333-378).—In continuing work previously noted (*E. S. R.*, 32, p. 23), the present investigations were undertaken to ascertain whether the variation in the malting power of different barleys could be regarded as an hereditary quality and, if so, to what extent it might be affected by soil conditions. The experimental work was conducted at the Svalöf experiment station during 1912, 1913, and 1914, employing Hannchen, Chevallier II, Swan Neck, Primus, Princess, and Golden barleys, and at Tystofte and Abed experiment stations during 1913 and 1914, using Tystofte Prentice, Svalöf Golden, Binder, Abed 570, Tystofte Cross, and Abed 110 barleys.

The nitrogenous substances formed the chief subject of study, as some of these materials which may appear during the malting and mashing of the barley are thought to impair the keeping qualities of the beer. The carbohydrate materials, on the other hand, do not occasion any difficulty. The quantity of wort extract was determined and is regarded as a measure of the amount of carbohydrates dissolved and should, according to the senior author,

comprise 73 per cent of the dry matter in the malt. The quantity of acid in the wort, the hydrogen ion concentration, and the intensity of the oxidation processes and of root formation were also studied. The courses of the different processes were traced through the steeped, ungerminated seed and through the steep and wort produced from the malt. Detailed tabulated data are presented and discussed. The results obtained are deemed inconclusive, but may be briefly summarized as follows:

The barleys examined showed no typical racial peculiarities in regard to malting power, and in no case was the relative velocity of the different metabolic processes of such a character as constantly to produce the disappearance of Albumin II after a suitable malting time. Golden barley, however, appeared to be particularly poor in proteolytic enzymes as compared with the other strains, the conversion of the insoluble proteins in the grain being relatively slight. The conversion of insoluble carbohydrates measured by the formation of the extract showed no racial distinction, the formation of the extract being more or less uniform for all varieties and attaining or exceeding the requisite 73 per cent of dry malt-stuff. No typical varietal characteristics were observed with respect to acid formation, loss by oxidation, or root growth.

Bean culture in California, G. W. HENDRY (*California Sta. Bul. 294 (1918)*, pp. 287-340, pl. 1, figs. 13).—The beans produced in California in 1917 are said to have constituted 44 per cent of the entire crop of the United States, and to have been grown on an area of approximately 558,000 acres located chiefly in southern California, in the Sacramento and San Joaquin Valleys, the Stockton Delta, and the central coast region. The field practices and cultural methods employed in growing the crop are described. Notes are presented on the agricultural history; the range in the State; the adaptations; and the utilization of the staple varieties of beans grown, including Lima, Pink, Small White, Blue Pod, Lady Washington, Blackeye, Cranberry, Bayo, Garbanzo, Red Mexican, Red Kidney, White Tepary, Horse, Henderson Bush Lima, French White, and Spotted Red Mexican. Brief agronomic descriptions of the different sorts are given in tabular form, together with information relative to the effect of the planting date on the blossoming and the life period of beans grown at Davis and Berkeley and on the amount of seed required to plant 1 acre.

The total average cost per acre of growing and marketing beans in California has been estimated to be \$55.23 for dry farming, \$52.68 for subirrigation, and \$60.88 for surface irrigation.

Tests of varieties of corn at Auburn, E. F. CAUTHEN (*Alabama Col. Sta. Bul. 200 (1918)*, pp. 27-36, figs. 16).—This reports the results of tests with 54 varieties of corn covering the period of 1906-1917, inclusive, in a continuation of work previously noted (*E. S. R.*, 17, p. 965). During this period the most productive varieties grown for three years or more included Unimproved Station Yellow, Alexander Prolific, Whatley, Unimproved Henry Grady, Sanders, Weekley, Hastings Prolific, Mosby, and Marlboro. All varieties having 145 or more ears and nubbins per 100 plants have been classed as prolific, those having from 126 to 144 as medium prolific, and those having 125 or less as nonprolific. Based on this classification these types have produced average yields of 34, 33.1, and 31.6 bu. per acre, respectively. Mosby, Sanders, Hastings Prolific, Davis Poor Land, Alexander Prolific, Whatley, Vardaman, and Hickory King, classed as prolific, have given more than 85 per cent grain by weight, while local White, Unimproved Henry Grady, Shaw, and Riley Favorite, all large-ear types, have given less than 80 per cent. The very early and very late varieties are said to have produced lower yields than the intermediate varieties.

A simple method of selfing cotton, G. R. HILSON and F. R. PARNELL (*Madras Agr. Dept. Yearbook, 1917, pp. 54, 55*).—A method of selfing cotton is briefly described whereby the flower is prevented from opening by sewing up the bud either in the early morning of the day on which it would normally open or the previous evening. The needle is passed through the bud about three times at a point approximately $\frac{1}{4}$ in. from the tip, the thread pulled as tight as possible without cutting the petals, and the needle then passed several times through one of the bracts, leaving about 2 in. of loose thread between the bud and the bract. After setting, the corolla withers and falls off, and being suspended by the thread effectively labels the boll.

Length of staple of cotton produced in North Carolina, O. J. McCONNELL (*N. C. Agr. Ext. Serv. Circ. 54 (1917), pp. 4, fig. 1*).—The percentages of the different lengths of staple of cotton grown in most of the counties of North Carolina are shown in tabular form.

Cotton culture in Algeria, TRABUT (*Gouv. Gén. Algérie, Dir. Agr., Serv. Bot. Bul. 54 (1917), pp. 35, figs. 13; Bul. Agr. Algérie, Tunisie, Maroc, 23 (1917), Nos. 4, pp. 65-77; 5, pp. 89-94; 6, pp. 113-129, figs. 13*).—The field practices employed in cotton production in Algeria are discussed, the more common cotton varieties and selections described, and the disease and insect enemies of the crop briefly noted.

Flax in Egypt (*Linum usitatissimum*), W. CARTWRIGHT (*Agr. Jour. Egypt, 6 (1916), pp. 1-8*).—A brief account of flax production in Egypt and of the preparation of the fiber for the textile trade.

Investigations on hops, IX, X, J. SCHMIDT (*Compt. Rend. Lab. Carlsberg, 11 (1917), No. 6, pp. 314-329, pl. 1; 330-332; abs. in Nature [London], 99 (1917), No. 2495, p. 510*).—Two papers are given.

IX. *The occurrence of the wild hop in Denmark*.—In continuation of work previously noted (*E. S. R., 33, p. 530*), the author summarizes information obtained through numerous inquiries regarding the wild hop and presents a colored chart showing the relative distribution of the plant in Denmark and northern Slesvig. It is stated that the wild hop is of little value for brewing purposes, due to its low rosin content, although an examination of plants from north Sealand revealed a bitter rosin content of approximately 14 per cent.

The author is uncertain as to whether the plant existed in Denmark prior to human habitation, as it has not been found in prehistoric deposits in that country. The plant is regarded as a troublesome weed, especially by the forest officials.

X. *On the aroma in plants raised by crossing*.—In continuing work previously noted (*E. S. R., 33, p. 530*), the author secured hybrid plants from a cross between an American male plant of a strain possessing the so-called American aroma (Cluster 3 7 a) and a female plant of European origin (Hallertauer spüt 27). The hops of the hybrid exhibited the typical American aroma. He concludes that despite the fact that the quality of aroma is entirely lacking in the male plant it can be transmitted nevertheless to the offspring through the male parent in which it is genotypically present.

The Indian species of *Iseilema*, R. S. HOLE (*Agr. Jour. India, Indian Sci. Cong. No., 1917, pp. 125-131*).—Two species of *Iseilema*, said to be the most valuable forest fodder grass in the Indian peninsula, are briefly described and are identified as *I. laxum*, a perennial, and *I. anthephoroides*, an annual, the former being deemed much superior to the latter.

The inheritance of the weak awn in certain *Avena* crosses, H. H. LOVE and A. C. FRASER (*Amer. Nat., 51 (1917), No. 608, pp. 481-493, figs. 2*).—This paper is a preliminary report of studies of factor differences between certain

types of awns, and forms a basis for further studies of the relation between awning and other characters of the oat grain. The material used included the weak-awned type represented by the Burt variety and a strain of Red Texas, the awnless type represented by Sixty-Day, and the strong-awned type represented by a strain of *A. fatua*. The parent plants and F_1 progeny were grown in the greenhouse, and the F_2 and F_3 individuals in the field. The studies were conducted at Cornell University in cooperation with the Office of Cereal Investigations, U. S. Department of Agriculture.

The F_1 progeny of Burt \times Sixty-Day were almost all awnless, while the F_2 individuals showed all degrees of awning, from the perfectly awnless type to those which were 100 per cent awned like the Burt parent. A study of the F_3 progeny was made to determine the number of factors concerned in the above cross, and from the data presented it was concluded that the awnless type was almost completely dominant in the first generation; that the second generation gave awnless, partially awned, and fully awned plants in a ratio approximating 1:2:1; that the fully awned plants behaved as pure recessives, breeding true in all cases in the second generation; that all of the partially awned F_2 plants were heterozygous, giving approximately 3 plants not fully awned to one fully awned plant in the third generation; that awnless plants of the F_2 generation comprised both homozygous plants of the parental type and heterozygous intermediates which later behaved as the partially awned F_2 plants; and that some awnless F_2 plants might be expected to be heterozygous since awnless plants were commonly found in the first generation.

The authors suggest that the difference between the weak-awned and the awnless varieties of the oats studied might be explained by the assumption of a difference in one pair of genetic factors, or that the presence of an inhibitory factor accounts for the partial dominance of the Sixty-Day over the weak-awned Burt. The data at hand seem to point to the presence of a factor inhibiting awning in Sixty-Day which appears to be linked with a factor for yellow color, while certain other crosses of the Burt variety show that it contains a factor for yellow color which does not inhibit awning. Unpublished data are said to show a very definite linkage of an inhibitory factor with a factor for yellow color in a cross between *A. fatua* and Sixty-Day.

Results of crosses between the strong awned and awnless types agreed closely with those obtained between weak awned and awnless types.

Additional studies were made on the presence of basal hairs and the type of articulation of the lower kernel of the spikelet. A marked correlation was observed between the fully awned condition and the presence of medium long basal hairs, such as exist on the Burt grains, and also between the fully awned condition and the Burt type of articulation. When all the spikelets were awnless the union of the lower kernel and its rachilla was usually of the *A. sativa* type, and the basal hairs were either short or lacking.

It was also noted that, in the crosses between weak awned and awnless types, wherever the panicle had two awns on a spikelet all of the spikelets on the panicle were awned. The irregular occurrence of these two awned spikelets and the wide variability in numbers on a panicle are held to indicate that there is no definite factor for the two-awned condition. The authors consider it more likely that the occurrence of such spikelets is due to environmental influences upon the factor for complete awning.

Note on copper sulphate as a stimulant for the rice crop, W. H. HARRISON and P. A. SUBRAHMANYA AYYAR (*Madras Agr. Dept. Yearbook, 1917, pp. 55-62, pl. 1*).—A series of three pot experiments are reported showing marked increases in the yields of rice from applications of small amounts of copper sulphate in the irrigation water. Increased yields of grain for manured pots

varied from 9.1 to 17.7 per cent and of straw and chaff from 10.1 to 16.2 per cent over the untreated checks. The increases for the unmanured pots ranged from 19.7 to 36 per cent in yield of grain and from -5.8 to +24.1 per cent in yield of chaff and straw.

A mill for the quantitative husking of paddy in small lots, F. R. PARNELL (*Madras Agr. Dept. Yearbook, 1917, pp. 52-54, fig. 1*).—A small wooden mill for husking rice in small quantities in variety tests is described and illustrated. It is claimed that the apparatus gives very little broken rice, even with varieties that normally break badly.

Effect of temperature and other meteorological factors on the growth of sorghums, H. N. VINALL and H. R. REED (*Jour. Agr. Research [U. S.], 13 (1918), No. 2, pp. 133-147, pls. 2*).—This article records data obtained by the Bureau of Plant Industry of the U. S. Department of Agriculture in observations on the growth of selected varieties of sorghum under widely varying climatic conditions at Puyallup, Wash.; Chico, Berkeley, Chula Vista, Bard, and Pasadena, Cal.; and Chillicothe, Tex.

Summarizing these results as well as the observations of other investigators, the authors conclude that "sorghum is semitropical in its adaptations and does not thrive in regions of low temperatures. Sunshine is probably an important factor of growth; witness the difference of growth at Chula Vista, Cal., and Puyallup, Wash., where the mean temperatures and the total positive heat units available are but little different. The 'physiological constant' for the ripening phase of sorghums according to Linsser's law of growth is about 0.53. Extremely high temperatures during the period of flowering and fruiting result in a decreased yield of seed. The date of planting should be so arranged that germination and early growth of the plants will take place during the period of high temperatures and the flowering and fruiting when more moderate temperatures prevail. Adverse weather conditions affect such supposedly stable characters as the number of leaves per plant, as well as the volume of growth."

A list of references to literature cited is given.

Sweet sorghums for forage, B. A. MADSON (*California Sta. Bul. 293 (1918), pp. 271-283, figs. 2*).—The value of sweet sorghum for forage in California is discussed, and cultural and harvesting methods are described. Limited variety tests are said to indicate that for a second crop following grain, grain hay, or some other spring crop, Early Amber and Red Amber were desirable, while for sections with relatively long growing seasons Honey was very promising.

The yield and nitrogen content of soy beans as influenced by lime, J. G. LIPMAN and A. W. BLAIR (*Soil Sci., 4 (1917), No. 1, pp. 71-77*).—In continuation in 1916 of work previously noted (*E. S. R., 34, p. 632; 36, p. 232*), the earlier results were confirmed. It was further demonstrated that the effects of lime upon the yield and percentage of nitrogen in the shelled beans of soy beans grown on limed and unlimed plats may extend to the top part of the plant when harvested as forage or as dry stalks and to the roots and their accompanying nodules.

A count of the nodules on the roots of plants from limed and unlimed plats showed an average of 83.6 nodules per plant for 6 varieties (Cloud, Hollybrook, Manchu, Medium Yellow, Ohio 9035, and Swan) grown on limed plats, and 50 nodules per plant for the same varieties grown on unlimed plats.

An average yield of 13.2 bu. per acre of shelled beans was secured on the unlimed plats as compared with an average yield of 19.3 bu. on the corresponding limed plats. The average nitrogen content of the beans was 5.73 and 6.15 per cent, respectively.

Plants harvested for forage showed an average nitrogen content in the tops of 3.08 per cent on limed plats and 2.67 per cent on unlimed plats, and in the roots 1.47 per cent and 1.24 per cent.

When harvested at maturity the average yield of stalks on the unlimed plats amounted to 1,342 lbs. per acre and on the limed plats, 2,041 lbs. per acre. The average nitrogen content was 0.615 and 0.791 per cent, respectively.

The average total yield of nitrogen recovered in the soy-bean crop from the unlimed plats was estimated to be 53.52 lbs. per acre, and from the corresponding limed plats 87.67 lbs. per acre. Based upon the amount of nitrogen recovered in nonleguminous crops grown on nearby plats having similar soil conditions and without the aid of commercial fertilizers or green manures, it is believed that as much as 65 lbs. of this nitrogen was derived from the air.

Soy beans.—A crop worth growing, R. A. MOORE and E. J. DELWICHE (*Wisconsin Sta. Bul.* 289 (1918), pp. 16, figs. 3).—This presents a popular account of the production and use of the soy bean in Wisconsin.

Report on the beet sugar industry in the United States (*Fed. Trade Com., Rpt. on Beet Sugar Indus., U. S., 1909-10-1913-14*, pp. XII+164).—This report deals chiefly with the cost and profits of growing sugar beets, the cost of manufacturing and marketing beet sugar, the profits in the manufacture and sale of beet sugar, and the relations between sugar beet growers and beet sugar manufacturers. The operations of all the beet sugar factories in the United States, except two small ones, are covered in detail during the 5-year period ended with the business year of 1913-14.

A study of the arrowing (flowering) in the sugar cane with special reference to selfing and crossing operations, T. S. VENKATARAMAN (*Agr. Jour. India* (1917), *Indian Sci. Cong. No.*, pp. 97-108, pls. 6).—Flowering in the sugar canes grown at the Coimbatore (India) Sugar Cane Breeding Station is discussed, and methods employed in selfing and crossing are described.

The following are deemed significant factors in arrowing of sugar cane: Geographical position, rainfall, interference with the vegetative growth, time of planting and soil conditions, and group or class peculiarities. Observations of field tests are reported to show the relative importance of these factors, also a study of the time and sequence of arrowing. Attempts to induce the thick canes of southern India to arrow simultaneously with the thin canes of northern India have so far met with little success.

Seedling cane, C. W. HINES (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 1, pp. 32-42, pls. 5, fig. 1).—The propagation of sugar cane by means of seed is discussed, with a brief historical outline of the practice. Experimental work with seedling cane at the Singalong Experiment Station was begun in 1915 in an effort to establish new varieties and strains better suited to local conditions than those now grown. The methods employed in the hybridization work are described.

Study of the sucrose variations in successive cane joints as they attain maturity with special reference to the death of the leaves, T. S. VENKATARAMAN and K. KRISHNAMURTI ROW (*Agr. Jour. India*, 1917, *Indian Sci. Cong. No.*, pp. 117-124, pls. 5; abs. in *Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 9, p. 1254).—A method is described for determining the sucrose value of sugar cane seedlings at an early stage of growth by means of an analysis of such portions of the cane as bear dead leaves as an indication of their maturity. Considerable tabulated data are presented, comparing analyses of numerous seedlings by this method, known as the "dead leaf" analysis, with the usual analyses made after the cane has attained maturity. The results are also compared graphically.

It was concluded that in very immature cane the highest sucrose content occurred in the lowest section, and as the cane advanced in maturity the region of high sucrose content gradually moved upward. Different canes of the same variety, analyzed on different dates, varied only slightly in maximum sucrose content. Canes remaining in the ground after attaining full maturity showed rapid deterioration at the basal joints. The maximum sucrose reading obtained by sectional analyses of any particular variety probably represents the maximum sucrose content of the variety under given conditions and has been designated as the "sucrose index" of the cane. This index is fairly constant for each variety or seedling and renders possible a comparison between different seedlings even when immature.

Trifolium alexandrinum [berseem], A. CARRANTE (*Il Trifogliolessandrino. Florence: Ist. Agr. Colon. Ital., 1916, pp. 144, pls. 19.*)—This is a detailed discussion on the production of *T. alexandrinum* in Italy.

The properties of Colorado wheat, W. P. HEADDEN (*Colorado Sta. Bul. 237 (1918), pp. 3-31.*)—The author presents in a somewhat popular form a summarized discussion of the results obtained in investigations already noted (*E. S. R., 33, p. 41; 37, p. 38*) dealing with the influence of various factors, including soil fertility, irrigation, and climatic conditions, on the quality of Colorado wheat.

Cleaned, treated, and tested seed for Colorado, W. W. ROBBINS, H. E. VASEY, and G. E. EGGINTON (*Colorado Sta. Bul. 238 (1918), pp. 3-40, figs. 11.*)—This bulletin embraces detailed discussions of the need of clean, pure, viable seed; of home methods of seed testing, including purity and germination tests; of methods of seed treatment for disease prevention in beans, cabbage, celery, wheat, oats, barley, corn, millet, flax, rye, timothy, and tomatoes; and of the Colorado pure seed law.

The rag-doll seed tester, G. J. BURT, H. H. BIGGAR, and C. E. TROUT (*U. S. Dept. Agr., Farmers' Bul. 948 (1918), pp. 7, figs. 6.*)—This describes a convenient inexpensive, and satisfactory method of testing seed corn for viability.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1918), No. 8, pp. 4.*)—Tabulated statistics are presented and discussed on the production of vegetable seeds by seedsmen, on the acreage grown by seedsmen or under their supervision, and on growers' prices quoted to dealers on advance growing contracts in the United States from data in the war emergency seed survey of January 31, 1918, and are compared with similar data for 1916 and 1917.

A further brief summary of the seed corn situation is given for Michigan, Ohio, Indiana, Illinois, Wisconsin, Minnesota, North and South Dakota, Iowa, Nebraska, Kansas, Missouri, and Kentucky.

The resolutions adopted and recommendations made by the advisory committee of agricultural and live stock producers pertaining to the seed activities of this Department and to the need of increased production and conservation of certain seed crops are presented.

Statistical information is given on the stocks and prices of buckwheat for seed and on the stocks, quality, demand, and prices of seeds of late-sown crops including alfalfa, sweet clover, rape, millet, and broom corn. The usual data as to imports of forage plant seed are included.

Seed report, 1916, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 293 (1917), pp. 25.*)—This reports the results of the analysis of 323 official samples and 173 special samples of seed during 1916.

Proceedings of the Association of Official Seed Analysts of North America, 1915 (*Proc. Assoc. Off. Seed Anal. No. Amer., 1915, pp. 48, fig. 1.*)—The

following papers were presented: Nonuniformity in Seed Testing Methods, by W. L. Oswald; Variations Observed in Purity and Germination Tests, by C. P. Smith; Variations in Germination and Purity Tests, by O. A. Stevens; Germination of Hulled and Unhulled Timothy Seeds as They Occurred in Samples Received at the Seed Laboratory, by W. L. Goss; Results Obtained by Testing Crimson Clover Seed for Germination in Soil in the Greenhouse and Between the Folds of Moist Blotting Paper, by W. L. Goss; Germination of Hulled and Unhulled Sweet Clover Seed, by W. L. Goss; A Comparison of the Weight Method and Count Method Used in Determining the Actual Value of Orchard Grass Seed, by W. L. Goss; The Development of Analytical Methods in European Seed Laboratories, by A. L. Stone; Imported Low Grade Crimson Clover and Orchard Grass Seed, by E. Brown; Types of Seed Imported as Rape, by E. Brown and F. H. Hillman; A Study of Oat Impurities in Iowa, by L. H. Pammel and Charlotte M. King; and Miscellaneous Notes and Problems Pertaining to Seed Testing, by G. T. French.

The report of the legislative committee includes an outline of the principles proposed for a uniform State seed law.

Buried weed seeds, WINIFRED E. BRENCHEY (*Jour. Bd. Agr. [London]*, 24 (1917), No. 3, pp. 299-306; *abs. in Country Life [London]*, 43 (1918), No. 1109, pp. 335, 336).—Experiments at Rothamsted covering a period of 18 months are reported to ascertain what weed seeds capable of germination occur at different depths in soils of arable fields, old pastures, and pastures of varying ages. A sampling tube 6 by 6 by 9 in. was driven into the ground flush with the surface and the soil carefully removed inch by inch, placed in paper bags, and labeled, and other samples taken to a depth of 12 in. The soils were later removed to sterilized pans or boxes, placed in a greenhouse, and kept moist. As soon as seedlings appeared and were identified they were removed. Three or four samples were taken from each field. The results are reported in tabular form and discussed separately for each field entering into the experiment. Owing to the location of the fields it was thought that very little contamination occurred due to wind-borne weed seeds. The author's conclusions may be briefly summarized as follows:

If very old pastures (300 years or more) be plowed it is improbable that arable weeds will occur to any extent the first year. Groundsel, sow thistle, and dock may be carried by the wind, and other arable weeds introduced with the crop seed, etc., resulting in a few years in a typical arable weed flora.

On more recent pasture lands (30 or 40 years old) the seeds of certain weeds appeared to lie dormant in the soil for long periods and to germinate when the land was broken and conditions of growth became favorable. Most weed seeds in the top few inches of soil tended to germinate even though the land was grassed over and were stifled by the grass and clover. Weed seeds at a depth of from 5 to 9 in., unable to germinate, retained their vigor for varying lengths of time, depending upon the species. There were relatively few seeds in the lowest 3 in.

Land under ordinary tillage contained a large number of arable weed seeds capable of germination, especially in the top 7 in. of soil. These seeds do not necessarily germinate the year after seeding, but may lie dormant and germinate among later crops.

Methods of cultivation and manuring greatly influenced the number of weed seeds present in the soil, root crops proving to be a valuable aid in cleaning the land, due to constant hoeing and the prevention of weeds from seeding.

HORTICULTURE.

Practical gardening, H. FINDLAY (*New York and London: D. Appleton & Co., 1918, pp. [XII]+388, pls. 16, figs. 25*).—A practical treatise on home gardening discussing the fundamental principles involved in growing the more common vegetables and fruits. In addition to the production of fresh vegetables for the spring and summer months, consideration is given to the growing and storing of vegetables and fruits to be used during the nonproducing months. The treatise concludes with a discussion of community gardens and a monthly working calendar.

Orchard and garden, B. W. DOUGLASS (*Indianapolis, Ind.: The Federal Publishing Co., 1918, pp. [18]+360, pl. 1, figs. 170*).—A guide book for beginners in fruit and vegetable growing for the market and for home supply, including greenhouse management. Consideration is given to the back yard garden and the home storage of fruits and vegetables, and several chapters deal with ornamental gardening.

Garden steps, E. COBB (*Boston: Silver, Burdett & Co., [1917], pp. XI+226, figs. 96*).—A small manual for the amateur in vegetable gardening.

War gardens, M. FREE (*New York and London: Harper & Bros., 1918, pp. 114*).—A pocket guide for home vegetable growers.

The back yard garden, E. I. FARRINGTON (*Chicago: Laird & Lee, Inc., 1918, pp. 191, figs. 12*).—A handbook for the amateur, the community, and the school.

Home gardens, W. E. LOMMEL (*Indiana Sta. Circ. 80 (1918), pp. 24, figs. 10*).—A popular article on home gardening, including planting directions for maintaining a continuous supply of vegetables in gardens 25 by 50 ft. and 50 by 100 ft. in size, respectively.

Vegetable gardening, S. B. GREEN (*St. Paul, Minn.: Webb Publishing Co., 1915, 14. ed., pp. 335, figs. 137*).—The present edition of this book on vegetable gardening for northern latitudes (E. S. R., 17, p. 463) has been revised by L. Cady to include new cultural practice, machinery, varieties of plants, and methods of controlling plant diseases.

Analyses of materials sold as insecticides and fungicides for 1917, C. S. CATHCART and R. L. WILLIS (*New Jersey Stat. Bul. 315 (1917), pp. 4-16*).—A report on samples of Paris green, lead arsenate, lime-sulphur, Bordeaux, and miscellaneous brands inspected and analyzed during 1917.

More care is needed in handling western cantaloups, G. L. FISCHER and A. E. NELSON (*U. S. Dept. Agr., Bur. Markets Doc. 9 (1918), pp. 11, figs. 4*).—This document contains suggestions on the picking and handling of cantaloups for long distance shipment, based upon handling and market investigations conducted in 1916 and 1917, the important data on which are here presented.

Briefly summarized the investigation shows that too premature picking, rough handling in harvesting and preparation for shipment, failure to refrigerate soon after picking, and wrapping the cantaloups have all contributed to serious waste and decay on the market. The cantaloups should be picked just before they reach full maturity, or will slip from the vines readily, in order to prevent overripeness at the market. Wrapping the cantaloups prevents the escape of condensed moisture upon removal from refrigeration, and thereby promotes decay.

Variety tests of tomatoes, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1916, pp. 12, 13*).—The results of a comparative test of 20 tomato varieties on the Truckee-Carson project in 1916 are presented in tabular form.

In connection with the test a plat protected with a few inches of wheat straw produced heavily until October 7, while in an unprotected plat the vines were killed by the first freeze on September 11.

Tomatoes for the canning factory, S. N. GREEN (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 121-124, figs. 2).—A discussion of the requirements for a canning tomato, together with data relative to season and yield of varieties tested at the station for three years, and suggestions on selecting and saving seed.

List of fruits recommended by the district horticultural societies (*Trans. Ill. Hort. Soc.*, n. ser., 51 (1917), pp. 25-28).—Lists are given of orchard and small fruits recommended for planting in northern, central, and southern Illinois.

Home improvement experiments, L. R. BREITHAUPT (*Oregon Sta. Bul.* 150 (1918), pp. 43-45, fig. 1).—Acclimatization tests of fruits conducted at the Harney substation at Burns for a number of years have shown that the season is too short for blackberries, dewberries, raspberries, loganberries, strawberries, and grapes. With a little irrigation, currants and gooseberries may be grown with some success.

The results with orchard fruits are presented in tabular form. The red Siberian crab apple, the Surprise plum, the Kaga hybrid plum, and the Compass cherry have shown distinct hardiness. These together with others of the hardiest crab apples and a few of the hardiest and best apples, such as Yellow Transparent and Duchess, are recommended for the home orchard where some irrigation can be given.

Notes are given on similar tests of shade trees and shrubs. Of the flowering shrubs, the common yellow rose, purple lilac, the red and white Tartarian honeysuckles, Siberian pea tree, a Chinese barberry, and a Chinese flowering peach are most promising. The Russian olive, laurel-leaved willow, and Russian poplar have proved to be the hardiest and best trees.

The abuse of water on fruit and trees, D. F. FISHER (*Proc. Wash. State Hort. Assoc.*, 14 (1918), pp. 19-27).—A discussion of insufficient and excessive irrigation as a means of promoting disease and injury to fruit trees and fruit. A brief summary of experiments conducted by the U. S. Department of Agriculture to determine the relation between soil moisture and apple bitter pit (*E. S. R.*, 38, p. 753) is included.

The effect of nutrition upon flower formation in fruit trees, MÜLLER-THURGAU (*Landw. Jahrb. Schweiz*, 31 (1917), No. 5, pp. 438-441).—In pot experiments here reported a greatly increased number of fruit buds was developed during the summer on two dwarf varieties of apples as the result of fertilizing with ammonium sulphate in the spring of 1915. Although a severe hailstorm prevented the securing of accurate fruiting records in 1916, observations for one variety, the Bismarck, showed a marked superiority in quantity and weight of fruit as a result of the application of nitrogen. The experiment is to be continued to determine the nature of changes in bud development brought about by the application of nitrogen.

Thinning out v. heading back as methods of pruning, V. R. GARDNER (*Proc. Wash. State Hort. Assoc.*, 14 (1918), pp. 57-64).—A paper on this subject based primarily on the results of pruning investigations at the Oregon Experiment Station.

Notes on a graft hybrid, L. RODWAY (*Papers and Proc. Roy. Soc. Tasmania*, 1915, pp. 108, 109, pl. 1, fig. 1).—The graft hybrid here described and illustrated is an apple picked from a Rome Beauty tree which had been grafted on a Senator stock. One side of the fruit resembles Rome Beauty and the other side Senator. Since this was the only apple of its kind on the tree, the author

suggests that it may have been developed from a migrating nucleus released from the stock when the grafting wound was made and which finally reached the growing point after the tree came into bearing.

Fertilizing apple orchards, F. H. BALLOU (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 125-127).—A popular summary of the more important results secured in cooperative orcharding experiments in southeastern Ohio (E. S. R., 36, p. 40).

A continuation of some of these experiments has confirmed previous conclusions relative to the beneficial effect of nitrate of soda on neglected orchards and the value of acid phosphate in encouraging the growth of clovers for mulching purposes. The grass-mulch system of culture continues to give somewhat better yields than the annual tillage with cover crop system with the same fertilization at an average annual reduced cost of \$14.43 per acre. Without the use of fertilizers in either case the tillage and cover crops plots have given a four-year average gain of 44 bbls. per acre over the grass-mulch section.

Spray calendar for apples and quinces (*New Jersey Stas. Circ.* 93 (1918), pp. 4, figs. 3).—A revision of Circular 75 (E. S. R., 37, p. 744).

Spray calendar for the peach (*New Jersey Stas. Circ.* 94 (1918), pp. 4, figs. 3).—A revision of Circular 79 (E. S. R., 37, p. 744).

Small fruits for home and market, W. J. GREEN (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 119-120, figs. 3).—Practical directions are given for starting and caring for strawberries, raspberries, and blackberries, including lists of varieties recommended for planting.

Inheritance of sex in the grape, W. D. VALLEAU (*Amer. Nat.*, 50 (1916), No. 597, pp. 554-564).—A short review of the literature on sex inheritance in certain plants and animals, together with a discussion of the sexual condition in the grape, a proposed hypothesis of the gametic condition of plants bearing the various flower types and their inheritance, and a theoretical consideration of the origin of the cultivated hermaphrodites.

Extending the limits of grape culture by means of certain hybrids, L. DANIEL and H. TEULIÉ (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 7, pp. 297-299).—The authors note the favorable results, both as to quality of product and resistance to phylloxera, obtained from the culture of certain sexual-asexual grape hybrids bred by Baco (E. S. R., 29, p. 148), and suggest the value of these graft hybrids in extending the limits of grape culture in Brittany.

The actual condition of hybrid bearers, E. PÉE-LABY (*Vie Agr. et Rurale*, 8 (1918), No. 13, pp. 219-221).—Notes are given on the condition of hybrid bearing grapes as observed by the Committee of Investigation of the Central Society of Agriculture in the Department of Haute-Garonne during 1917.

The hybrid direct bearers in Drome in 1917, A. DESMOULINS and V. VILLARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 39 (1918), Nos. 19, pp. 439-444; 20, pp. 468-473; 22, pp. 512-516).—In continuation of previous data (E. S. R., 36, p. 641) observations are given for the eighteenth year relative to the behavior of hybrid direct-bearing grapes in the valley of the Rhone. The present report deals especially with grapes grown in the Department of Drome.

Girdling the Corinth grape to make it bear, G. C. HUSMANN (*Jour. Heredity*, 9 (1918), No. 5, pp. 201-210, figs. 7).—This paper is essentially the same as one noted from another source (E. S. R., 38, p. 346).

The Chanez grape (*Cal. Bd. Vit. Comrs. Bul.* 11 (1918), pp. 19, figs. 10).—The Chanez variety of Almeria table grape, which possesses excellent keeping qualities, has been widely distributed for trial in California. This bulletin

contains a translation of an account by F. Richter of the Ohanez¹ as grown in Spain. It also contains notes by F. T. Bioletti on the Ohanez grape in California, including a description of the cordon system of pruning and training which is specially adapted to the Ohanez vine.

Biological and morphological investigations on the olive and on its varieties cultivated in France, J. RUBY (*Ann. Sci. Nat. Bot.*, 9. ser., 20 (1917), No. 1-6, pp. 1-286, figs. 86).—Part 1 of this work comprises a general botanical study of the olive, including the germination and early development of the tree and morphological, physiological, and chemical studies of the tree and fruit. Part 2 deals with variations among olives, with special reference to different conditions of environment and culture. The varieties of olives cultivated in France are then classified with reference to variations in the character of leaf, fruit, and stone. Part 3 comprises a monograph on French varieties of olives.

Structure of wood in blueberry and huckleberry, ESTHER M. FLINT (*Bot. Gaz.*, 65 (1918), No. 6, pp. 556-559, pls. 2).—An examination of the anatomy of *Vaccinium* and allied genera as compared with that of the wood of *Quercus*.

Annual report of the California Avocado Association for the year 1917 (*Rpt. Cal. Avocado Assoc.*, 1917, pp. 138, pls. 8, figs. 20).—In addition to routine reports of the meetings held in Los Angeles in May, 1917, and in Riverside, October, 1917, a number of papers dealing with avocado varieties, culture, cold resistance, heat injury, composition and nutritive value, and utility are included. A paper not read at the meetings entitled Exploring Guatemala for Desirable New Avocados, by W. Popenoe (pp. 104-138) is also included.

Third report on cacao selection in Djati Boenggo, E. E. L. MACGILLAVRY and C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java*, No. 30 (1917), pp. 9).—A further progress report on selection studies with cacao trees (*E. S. R.*, 32, p. 235).

Budding and grafting of citrus trees, R. A. DAVIS (*Union So. Africa Dept. Agr. Local Ser. No. 7* (1917), pp. 15, pl. 1, figs. 9).—Directions are given for budding and grafting young trees in the nursery and top-working older trees, with special reference to conditions in South Africa.

Notes on California and Arizona grapefruit, E. M. CHACE and C. G. CHURCH (*Cal. Citrogr.*, 3 (1918), No. 9, pp. 200, 201, fig. 1).—The authors here present data derived from a comparative study of the physical and chemical character of the standard type Marsh Seedless grapefruit and of other types of this variety.

The data show that fruits that are pear-shaped and coarse in appearance have a low specific gravity, a high percentage of rind and fiber, and a low percentage of juice. These fruits often have a high percentage of seeds and early in their growth develop hollow centers. The richness of juice compares favorably with the smooth, thin skinned, and slightly flattened standard type.

Analyses were made from time to time of grapefruit picked and stored for several weeks as compared with fruit left on the tree. The results indicate that after storage the fruit changes but little in ratio of sugar to acid, while the fruit left on the tree continues to mature and become sweeter. With fruit picked at the proper stage of maturity there is no apparent advantage in storing before shipment.

Renewing old lemon trees, J. D. CULBERTSON (*Cal. Citrogr.*, 3 (1918), No. 9, pp. 202, 203, figs. 6).—This comprises some data and observations relating to old lemon trees that have had a heavy pruning.

Why navel oranges are seedless, A. D. SHAMEL (*Cal. Citrogr.*, 3 (1918), No. 9, p. 204, figs. 2).—A popular discussion of this subject in which the author

¹ *Traité Général de Viticulture.—Ampélographie*, P. Viala and V. Vermorel (Paris: Masson & Co., 1903, vol. 4, pp. 356-360, pl. 1).

cites experimental work tending to show that seedlessness in the navel orange is entirely due to absence of pollen in the flowers.

Satsuma orange, R. E. BLACKBURN (*Ga. State Col. Agr. Circ.* 76 (1918), pp. 4).—Methods of propagating and growing Satsuma oranges are discussed.

Investigations dealing with the coconut palm, P. C. VAN DER WOLK (*Cultura*, 30 (1918), Nos. 353, pp. 20-33; 354, pp. 41-61, pls. 2).—The results of the author's investigations on the flower biology of the coconut, conducted at the Buitenzorg Botanic Station during a period of about two years, are here reported.

Third report on selection tests of Robusta coffee in Banaran, C. VOÛTE and C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java*, No. 31 (1917), pp. 8, pls. 2).—In continuation of previous reports (*E. S. R.*, 32, p. 236) data are given showing the character and yield of the progeny of Robusta coffee trees, resulting from breeding and selection experiments in Java.

Tea culture in various countries (*Dept. Landb., Nijv. en Handel [Dutch East Indies]*, *Meded. Proefstat. Thee*, No. 57 (1917), pp. 40, pl. 1).—The following articles on tea and its culture are included under the above general heading: The Tea Plant and Tea Culture in French Indo-China, by C. P. C. Stuart (pp. 3-17); The Culture and Preparation of Tea in the United States of America, by C. Bernard (pp. 22-30); Tea in British New Guinea, by C. Bernard (pp. 31, 32); and Tea in Natal, by J. J. B. Deuss (pp. 33-36). A résumé in French of the above articles is given by C. Bernard (pp. 37-40).

The American rose annual, edited by J. H. McFARLAND (*Harrisburg, Pa.: Amer. Rose Soc.*, 1918, pp. 188, pls. 9, figs. 13).—As in previous editions (*E. S. R.*, 37, p. 145) the annual for 1918 contains articles by various authorities on rose propagation, breeding, culture, species and varieties, testing gardens, diseases, rose shows, roses in England and France, miscellaneous notes on roses, and a report on the work of the American Rose Society. The partial list of roses introduced in America is revised and considerable prominence is given to new varieties.

Purple bud sport on pale-flowered lilac (*Syringa persica*), FRIEDA COBB and H. H. BARTLETT (*Bot. Gaz.*, 65 (1918), No. 6, pp. 560-562, fig. 1).—An illustrated description is given of a deep purple bud sport that developed on a pale-flowered lilac after the bush had been flowering for 10 years or more.

Magnolias for northern lawns, W. E. BONTRAGER (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 159, 160).—A popular discussion of magnolia species suitable for home planting in the North, including suggestions for protecting magnolias from severe winter weather and early spring frosts.

The useful viburnums or snowballs, W. E. BONTRAGER (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 135, 136).—Notes on the use of viburnums for planting on the lawn, including suggestions on species suitable for Ohio conditions.

Some new plants at home and abroad, N. E. HANSEN (*Minn. Hort.*, 46 (1918), No. 6, pp. 229-235, fig. 1).—Brief notes are given on several ornamentals observed in Siberia, some of which are already being grown in this country.

Flowers: Production, commerce, customs regulations, G. VAGLIASINDI (*Comitato Naz. Tariffe Dog. e Trattati Com.*, Sez. 3, *Monograph* 4 (1917), pp. 108).—An account of cut-flower growing in Italy, past and present, commercial trade in cut flowers with other European countries, and customs regulations of European countries relating to shipments of cut flowers.

Autumn in the flower garden, D. LUMSDEN (*Cornell Reading Course for Farm*, No. 128 (1917), pp. 73-108, figs. 14).—A popular treatise on flower gardening with special reference to the planting of hardy perennials. Descriptive lists are given of herbaceous perennials for the home flower garden, classified

according to color of bloom, together with lists of desirable plants for different sites and soils.

Garden guide.—The amateur gardeners' handbook, edited by J. H. DICK and A. T. DE LA MARE (*New York: A. T. De La Mare Co., Inc., 1918, 3. ed., rev. and enl., pp. 336, figs. 290*).—The present edition of this work (E. S. R., 37, p. 145) has been revised and enlarged.

Home grounds: Their planning and planting, L. H. BAILEY (*Harrisburg, Pa.: J. Horace McFarland Co., 1918, pp. II+48, pls. 2, figs. 44*).—A popular treatment of the subject, including a number of planting plans comprising home areas, ranging in size from the city lot to the farmstead.

Rockeries.—How to make and plant them, H. H. THOMAS and S. ARNOTT (*London and New York: Cassell & Co., Ltd., 1917, pp. VIII+142, figs. 109*).—A popular treatise on the subject.

The Bradley bibliography.—V, Index of authors and titles; subject index, A. REHDER (*Cambridge, Mass.: Riverside Press, 1918, vol. 5, pp. XXXII+1008*).—This volume of the bibliography on woody plants (E. S. R., 34, p. 435) which completes the work contains the index of authors and titles enumerated in the preceding volumes and in the additions and corrections to the preceding volumes which appear in this volume. It also contains the subject index to all the volumes.

FORESTRY.

Report of the subcommittee on forestry, F. D. ACLAND ET AL. (*Min. Reconst. [Gt. Brit.], Reconst. Com., Forestry Subcom., Final Rpt., 1918, pp. 105, fig. 1*).—This comprises the final report of the Subcommittee on Forestry of the Reconstruction Committee, which was instructed "to consider and report upon the best means of conserving and developing the woodland and forestry resources of the United Kingdom, having regard to the experience gained during the war."

Part 1 discusses the position of forestry in the United Kingdom, national requirements in timber and prospects of supply, experience gained as a result of the war, and the case for adopting an adequate forest policy for the United Kingdom. Part 2 considers the forest policy which should be adopted to meet the serious timber situation brought out in part 1. The question is considered with reference to the area of forest needed, available forest areas and their distribution, methods of securing afforestation and replanting, forestry in relation to employment and food supplies, the promotion of silviculture, the development of the forest industry, the forest authority and its functions, the financial aspect of afforestation, and estimate of the sum required to finance the operations of the forest authority for the first 10 years. Reservations of two members of the committee, L. C. Bromley and Lord Lovat, are included, and a number of memoranda and notes dealing with the report are appended.

Tropical forests and the war, H. N. WHITFORD (*Jour. Forestry, 16 (1918), No. 5, pp. 507-522*).—This paper gives a brief inventory of the timber supply of various tropical countries and discusses the role that tropical timbers are likely to play in the readjustment of the world's demand for timber. A bibliography of consulted literature is appended.

Progress report of forest administration in the Punjab for the forest year 1916-17, R. MCINTOSH (*Rpt. Forest Admin. Punjab, 1916-17, pp. [12]+22+LVII, pl. 1*).—The usual report relative to the administration of the State forests of the Punjab (E. S. R., 37, p. 146).

Roadside trees in North Carolina, J. S. HOLMES (*N. C. Geol. and Econ. Survey, Press Bul. 162 (1918), pp. 8*).—An address on this subject discussing the preservation and planting of roadside trees and the legal status of roadside

trees in North Carolina and in some other States, and suggesting new legislation on the subject.

Canadian Douglas fir: Its mechanical and physical properties, R. W. STEVENS (*Dept. Int. Canada, Forestry Branch Bul. 60* (1918), pp. 84, figs. 59).—This bulletin presents the results of small clear specimen, mechanical and physical, tests on Douglas fir conducted at the Forest Products Laboratories of Canada. The methods followed in making the various tests are described in detail.

French fir management in the Vosges, T. S. WOOLSEY, JR. (*Jour. Forestry, 16* (1918) No. 5, pp. 535-549).—A translation of an important French paper on this subject¹ with the view of presenting ideas to the American profession which may be followed in the United States.

Preliminary volume tables for larch (*Jour. Bd. Agr. [London], 24* (1918), No. 12, pp. 1430-1435, fig. 1).—The volume tables here given are based on measurements of larch trees felled in connection with the statistics which the British Board of Agriculture are collecting as to the rate of growth of timber under different conditions.

Method of working bamboos, E. MARSDEN (*Indian Forester, 44* (1918), No. 4, pp. 147-165).—Tabular data are given showing the results of various systems of working bamboos, as observed on experimental plats that were laid out by R. S. Troup in 1910 and have been examined in detail annually for the last eight years.

Production of guayule rubber, H. C. PEARSON (*U. S. Dept. Com., Com. Rpts., No. 149* (1918), pp. 1172-1184).—An account of the guayule rubber shrub (*Parthenium argentatum*) with reference to its botany, distribution and supply, regrowth in wild areas, cultural experiments, extraction processes, yields, prices, etc.

Investigations with wood conducted at the forestry experiment station, H. BEEKMAN (*Boschbouwk. Tijdschr. Tectona, 11* (1918), No. 1-2, pp. 1-82, pl. 1, figs. 10).—An account of investigations conducted with the woods of Netherlands East Indies. The work deals with the identification of the woods by external characteristics and anatomic structure, their mechanical and physical properties, chemical composition, durability, and preservation. The results of mechanical tests are appended in tabular form.

The yield of volunteer second growth as affected by improvement cutting and early weeding, R. T. FISHER (*Jour. Forestry, 16* (1918), No. 5, pp. 493-506, figs. 3).—This paper presents the results of certain experiments, computations, and silvicultural experiences bearing on the practical possibility of increasing the final value of volunteer second growth forests by early weeding or improvement cuttings. The data were gathered in northern Worcester County, Mass.

The spacing of trees, E. GIRARD (*Bul. Écon. Indo-Chine, n. ser., 21* (1918), No. 129, pp. 218-231).—This comprises data and observations on the relative merits of various planting distances with reference to Hevea rubber trees when planted in a pure stand and also with reference to the planting of coffee in stands of Hevea rubber trees and of coconut palms.

Growth of trees, with a note on interference bands formed by rays at small angles, A. MALLOCK (*Proc. Roy. Soc. [London], Ser. B, 90* (1918), No. B 627, pp. 186-199, figs. 11).—The author made some trial growth measurements of living trees by using an apparatus previously designed for observing the extension of cracks in buildings. The apparatus is illustrated and described and measure-

¹ Le Traitement des Sapinières Basé sur la Notion d'Espaceement des Tiges. A. Gazin (Paris, 1902).

ment records for several trees are given. The records are taken by reading variations in the position of interference bands which are formed by rays making small angles with the reflecting surface. The theory of interference bands is discussed.

The absolute form quotient, H. CLAUGHTON-WALLIN (*Jour. Forestry*, 16 (1918), No. 5, pp. 523-534).—A review of investigations on the stem forms of Norway spruce and Scotch pine, conducted by T. Jonson, and which have led to the construction and adoption for use by the Swedish Forest Service of volume taper and growth per cent tables for these species.

Taxation of woodlots, K. W. WOODWARD (*N. H. Col. Est. Circ.* 39 (1918) pp. 19).—This comprises a summary of investigations conducted by the Forest Service of the U. S. Department of Agriculture, the State Forestry Commission, and other agencies relative to the effect of taxes on New Hampshire woodlots. The experience of other States is briefly reviewed and a bibliography on forest taxation, prepared by Helen F. Stockbridge, is appended.

DISEASES OF PLANTS.

Bacteriology in plant pathology, F. L. STEVENS (*Trans. Amer. Micros. Soc.*, 36 (1917), No. 1, pp. 5-12).—The purpose of this paper is to direct attention to the place and importance of bacteriology in the field of plant pathology and to summarize the progress made therein since the establishment of the science. The subject is considered in both its broader general aspects and its more special relations.

Studies in the physiology of parasitism.—IV, On the distribution of cytase in cultures of *Botrytis cinerea*, W. BROWN (*Ann. Bot. [London]*, 31 (1917), No. 123-124, pp. 489-498).—This work, though purely of enzymological interest, is said to have been introduced into the present series (E. S. R., 37, p. 47) on account of the light it may throw on the nature of extracts employed by previous investigators, and also on account of its bearing on the mode of secretion of enzymes by fungi and upon the technique of extraction, rules for which are given with general discussion of the factors involved and results obtained.

It is stated that dense sowings of spores gave a much stronger enzyme extract than was obtained from thin sowings, the outstanding difference between the two cases being apparently that in the former a greater proportion of the hyphal mass is in a state of vigorous growth or has recently passed through such a state. Apparently the growing region of the hypha is the source of the enzyme, the older portions not contributing an appreciable amount, but possibly reducing the amount actually produced by adsorption. Further facts are cited in support of the view that enzyme production is confined to the growing apex of the hypha.

Two types of enzymic preparations are derivable from cultures of *B. cinerea*, namely, watery extract of the ground mycelium, and the fluid in which germination and growth have taken place. It is further stated that the amount of enzyme and the amount of the enzyme-retarding substances present under such varied experimental conditions as density of culture, age of same, or nature of medium were determined in each case. Discussion is given of the process of enzyme extraction by fungi and of the bearing of these facts on the technique of enzyme extraction.

Methods for the differentiation of pathogenic fungi in the tissues of the host, C. S. RIDEWAY (*Phytopathology*, 7 (1917), No. 5, pp. 389-391).—The author describes two methods of staining which he has used to locate and trace

the mycelium of pathogenic fungi in sections of tissue of the host plant. Both these methods have been found effective in connection with *Botrytis* and *Rhizopus* in strawberry fruits, *Pythium debaryanum* in potato tubers, *Fusarium* in tobacco stems, the aërial stage of crown rust of oats in leaves of *Rhamnus cathartica*, etc.

Alternaria on *Datura* and potato, R. D. RANDS (*Phytopathology*, 7 (1917), No. 5, pp. 327-333, figs. 4).—A detailed account is given of the results of an extended investigation of species of *Alternaria* which occur parasitically on potato and other solanaceous plants, some of the data having already been published (E. S. R., 33, p. 451).

It is claimed that the fungus which causes the early blight of potato differs from that which produces the leaf spot and pod blight on the jimson weed and allied species of *Datura*. The latter species of *Alternaria* is said to be *A. crassan* n. comb., a technical description of which is given.

Arthropods and gasteropods as carriers of *Cronartium ribicola* in green-houses, G. F. GRAVATT and R. P. MARSHALL (*Phytopathology*, 7 (1917), No. 5, pp. 368-373).—Studies were made with ants, sow bugs, snails, cockroaches, etc., to determine their ability to carry spores of *C. ribicola* to various species of *Ribes* and to white pine.

The small animals tested were found to be bearers of numerous urediniospores and sporidia of *C. ribicola*, the urediniospores and sporidia adhering to the bodies of the animals under certain conditions for at least a week. The excreta of small animals fed on the different spore stages of the blister rust fungus showed abundant urediniospores and in some cases sporidia and pieces of telial columns. Alimentation was found to lessen the viability of the spores.

Some diseases of economic plants in Porto Rico, L. E. MILES (*Phytopathology*, 7 (1917), No. 5, pp. 345-351, figs. 3).—In notes on parasitic diseases on a number of economic plants, the author reports *Mycosphaërella perseæ* on the avocado, *Cercospora carbonacea* on the yam (*Dioscorea* sp.), and *Helminthosporium mayaguezense* on *Paspalum conjugatum*. Technical descriptions of these new species are to be published elsewhere.

Cereal smuts and the disinfection of seed grain, H. B. HUMPHREY and A. A. POTTER (U. S. Dept. Agr., *Farmers' Bul.* 939 (1918), pp. 28, figs. 16).—Descriptions are given of the smuts of corn, wheat, rye, barley, oats, sorghum, and millet, together with methods of disinfection.

For the loose smuts, particularly those of barley and wheat, treatment with hot water has been found the only efficient method of control. For other smuts, treatment with formaldehyde or copper sulphate, either by soaking or sprinkling, has given favorable results. After treatment with copper sulphate, the seed grain should be limed if injury to germination is to be avoided. As the disinfecting treatments may injure germination, it is recommended that the seed be tested for germination and the rate of seeding determined from the results of the test.

The spray method of applying concentrated formaldehyde solution in the control of oat smut, R. J. HASKELL (*Phytopathology*, 7 (1917), No. 5, pp. 381-383).—A description is given of a method of applying formaldehyde for the prevention of oat smut, which consists essentially of spraying the seed as it is being shoveled from one pile to another with a solution of 1 part 40 per cent formaldehyde to 1 part water, the solution being used at the rate of 1 qt. to 50 bu. seed. The seed should then be covered with blankets, canvas, or sacks for about five hours, after which it may be uncovered and planted.

The chief advantage of this method, which has been very successfully used, lies in the fact that the seed is not wet and thus does not swell nor cause

trouble by sticking in the drill. The operation is simpler than that of sprinkling, and the treatment is effective and noninjurious to the seed.

Bean rust and spot diseases, P. J. SCHENK (*Tijdschr. Plantenziekten*, 23 (1917), No. 5, *Sup.*, pp. 25-34).—These notes refer to observations on bean diseases, variously named, as related to *Uromyces appendiculatus* and *Glæosporium (Colletotrichum) lindemuthianum*.

Relation of temperature to the growth and infecting power of *Fusarium lini*, W. H. TISDALE (*Phytopathology*, 7 (1917), No. 5, pp. 356-360, pl. 1, fig. 1).—A report was given in a previous publication of studies on the nature and inheritance of resistance in flax to the wilt disease caused by *F. lini* (E. S. R., 38, p. 449). In the present paper, the author gives a discussion of the relation of temperature to the growth and infecting power of the parasite.

The critical temperature for the infection of flax by *F. lini* is said to be about 15° C. Flax is said to thrive well at temperatures as low as 13°. There appears to be a close correlation between the temperatures at which *F. lini* grows best in pure culture and those at which flax wilt is most destructive.

Control of lettuce rot, E. LEVIN (*Phytopathology*, 7 (1917), No. 5, pp. 392, 393).—The author calls attention to the control of soft rot of lettuce due to *Bacterium viridilividum* obtained by spraying diseased plants with formaldehyde at the rate of 1 pint to 30 gal. water. This method of treatment was tested in fields with very excellent results in 1916 and again in 1917. It is pointed out that this treatment differs from the ordinary protective spray in that it seems actually to check the disease already in progress.

Soil fungi in relation to diseases of the Irish potato in southern Idaho, O. A. PRATT (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 2, pp. 73-100, pls. 2, figs. 4).—An account is given of investigations conducted by the Bureau of Plant Industry of this Department on the relation of soil fungi to certain diseases of potatoes. In a former publication (E. S. R., 35, p. 751) it was shown that planting disease-free potatoes on land that had never been in cultivation could not be considered a guaranty of a disease-free product.

In order to verify this conclusion, plantings of disease-free seed were again made in 1916 on lands that had never been in potatoes, and the results of the examination made when the tubers were dug are given. As in the previous experiments, the percentage of infection was found lower on irrigated, previously cultivated land than on virgin desert land.

During 1916, in addition to the field work with potatoes, cultures were made from the soils, from which more than 50 species of fungi were isolated. Among these there were quite a number of species of *Fusarium*, several of which are described as new species. Three fungi, *F. radicolica*, *F. trichothecioides*, and *Rhizoctonia solani*, known to be parasitic on the potato, were isolated from soils never cropped to potatoes. The presence of these and other fungi suggests that infection in potatoes may often originate with soil organisms.

From the results of these experiments it is suggested that land previously planted to such crops as alfalfa, clover, and grain is better adapted to the production of disease-free potatoes than virgin desert land.

Investigations on potato diseases (eighth report), G. H. PETHYBRIDGE (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 17 (1917), No. 4, pp. 595-605, pls. 2).—These investigations as carried on during 1916 were more limited in scope than formerly (E. S. R., 37, p. 350).

Phytophthora infestans appeared first at Rockfield on June 6, becoming prevalent over the country about the middle of July. A summary is given of the tests made of the relative efficiencies of 1 per cent and 2 per cent copper

sprays in this connection. This would indicate that a strength of 1 per cent may be advantageous under ideal conditions of application, but that as a practical treatment 2 per cent is probably to be preferred. Resistance appears to have been weakened in certain varieties hitherto valued for that quality. The resistance factor for blight (*P. infestans*) is not protective against pink rot (*P. erythroseptica*).

Botrytis disease (*B. cinerea*) has not yielded any evidence that Botrytis is a stage in the life history of *Sclerotinia fuckeliana*, as has been supposed by some investigators.

It has been found that potato tubers are most susceptible to dry rot (*Fusarium caruleum*) as the time approaches at which sprouts normally appear. This fungus does not produce a wilt of potato.

It has been found that *Verticillium albo-atrum* can be at least rendered harmless in the tissues of potato tubers kept in an incubator at 46° C. (114.8° F.) for 10 hours, no injury resulting to the potatoes, while exposure for 20 hours apparently impairs the vitality of the tubers to some extent.

Gravy eye, or mattery eye, in potatoes, R. WATERS (*Jour. Agr. [New Zeal.], 14 (1917), No. 5, pp. 357-362*).—It is stated that much damage has been done since 1916 in the vicinity of Pukekohe by a bacterial disease of potato, the general characters of which agree with those of the American black rot of potatoes due to *Bacillus solanacearum*. The virulence of the outbreak appears to be related to heat and moisture, poor drainage being especially favorable to the trouble.

Copper sprays for late blight of potato, P. CHAVAN (*Ann. Agr. Suisse, 18 (1917), No. 2, pp. 206-216, figs. 2*).—Giving the results of variety and other tests regarding late blight (*Phytophthora infestans*) of potato, the author states that choice of resistant varieties is of the highest importance, although resistance is subject to variation, especially in different soils or circumstances. Preventive measures include careful selection, for planting purposes, of whole tubers known to be of resistant stock; keeping seed potatoes in cool, dry, well-aired cellars; and arrangement of the rows in planting to agree with the direction of the prevailing winds.

Bordeaux mixture to be applied as a preventive should not run below 2 per cent strength as regards copper sulphate. This should be applied at least three times in case of clayey soil or susceptible varieties during years of high humidity. Care should be taken to wet the lower surface of the leaves.

Stem nematodes as tobacco pests, T. A. C. SCHOEVEERS (*Tijdschr. Plantenziekten, 23 (1917), No. 5, pp. 167-180, pls. 2*).—An account is given of attack by a nematode (*Tylenchus devastatrix*) on stems of growing tobacco and the effects on the plant.

Tomato diseases in Ohio, J. G. HUMBERT (*Ohio Sta. Bul. 321 (1918), pp. 157-196, figs. 13*).—Descriptions and suggestions for control, so far as definite means are known, are given for the following parasitic diseases: Rhizoctonia and other damping-off fungi, Fusarium wilt, bacterial wilt, stem rot or timber rot, leaf spot or leaf blight, early blight, late blight, anthracnose, Botrytis rot, leak, leaf mold, and root knot due to nematodes. In addition, the following physiological diseases are described: Point rot, hollow stem, mosaic, and blossom drop.

In connection with experiments for the control of Fusarium wilt, the author gives the results of two years' trial of resistant strains. It appears from these tests that certain strains of the more common varieties of tomato show very marked differences in the percentage of plants subject to attack.

[Orchard sprays, hose, and nozzles], B. W. DOUGLASS (*Trans. Ind. Hort. Soc. 1916, pp. 89-96, figs. 2*).—In a report, followed by discussion, regarding

experiences in orchard spraying for diseases as well as insects, it is stated that the triple Vermorel nozzle is on the whole the best for all purposes. The best form of hose is one having a thick inner tube of rubber, around which are wrapped seven layers of fabric in spiral sheets, and not in a series of woven tubes, which would stretch in length and contract in diameter.

Bordeaux mixture fully up to the standard is said to have been obtained by employment of a method which is described as very simple, convenient, and comparatively inexpensive. A copper solution is employed in which 1 gal. of liquid represents 1 lb. copper sulphate. This is prepared in an overhead tank from which it is to be fed by gravity into the sprayer tank, each vertical inch of this tank representing a definite number of pounds of copper sulphate. The sprayer tank is first filled with clear water from a pressure tank, the proper amount of lime is added under agitation from the sprayer engine, and to this the copper is added while the engine is running.

The rôle of insects as carriers of fire blight, H. A. GOSSARD (*Rpt. Proc. Mont. State Hort. Soc.*, 19 (1916), pp. 84-90).—This is an attempt to summarize what is known of the carriers of fire blight, from which Ohio orchards are said to have suffered severely during several seasons. The weather conditions during this time have encouraged the multiplication of aphids, which are thought to be instrumental in the dissemination of the disease, especially in starting the infection early in the season. The general adoption of the mulch system and the increased use of barnyard manure and in general of nitrogenous fertilizers and deemed contributory (sensitizing) factors.

The author considers the possibility that bees may carry infection into the hive. This may become a very important source of infection for blooms on trees in the areas tributary to such a hive.

The possible agency of other insects is also discussed in this connection.

Apple bitter rot and its control, J. W. ROBERTS and L. PIERCE (*U. S. Dept. Agr., Farmers' Bul.* 938 (1918), pp. 14, figs. 3).—A description is given of apple bitter rot caused by *Glomerella cingulata*, together with directions for its control. The suggested means of control include removal of sources of infection and spraying with Bordeaux mixture.

Brown bark spot disease, H. E. MORRIS (*Rpt. Proc. Mont. State Hort. Soc.*, 19 (1916), pp. 58-62, figs. 4).—A brief discussion is given of the recognition in 1910 and subsequent study of the brown bark spot of apple. Standard varieties of some other fruits are also affected in the same way. Apple and pear are severely attacked, but only a few cases are known to have occurred on plum and prune. Crab apple, also sweet and sour cherries, showed the symptoms, which are described. Bearing apple trees are killed in three to five years, pear trees in two to four years. The specific cause of the trouble is not known. Direct inoculation has given uniformly negative results.

The effects of fertilizers and spraying are to be tested on a block of trees in a commercial orchard.

Apple scab control, R. H. ROBERTS and G. W. KEITT (*Ann. Rpt. Wis. State Hort. Soc.*, 47 (1917), pp. 46-56).—Presenting the results of cooperative work and observation, the authors agree that as possible fungicides for use against apple scab Bordeaux mixture excels in effectiveness as regards fungicidal action, lime-sulphur as regards freedom from injury to fruit and foliage, and a treatment combining the two offers opportunity for adaptation to weather and other conditions as may appear appropriate in given circumstances. It is stated that lead arsenate added as an insecticide improves the fungicidal value of lime-sulphur.

Near Madison, Wis., but few apparently mature spores were found from April 26 to May 4, but on May 9 they appeared in considerable abundance. It is thought that the first application should be delayed, if possible without too great infection, until the young fruits have separated in the clusters sufficiently to be thoroughly covered by the spray.

A bacterial blight of pear blossoms occurring in South Africa, ETHEL M. DORRIDGE (*Ann. Appl. Biol.*, 4 (1917), No. 1-2, pp. 50-74, figs. 7).—The author gives the results of her study of a disease affecting pear blossoms. An organism associated with the trouble was studied in comparison with the fire blight organism (*Bacillus amylovorus*) and the one studied by Barker and Grove (E. S. R., 36, p. 751) in connection with a disease of fruit blossoms and of the gooseberry. This organism appears to be distinct from both of those mentioned, and is probably a new species. The author, therefore, describes the organism under the name *Bacterium nectarophilum*.

The control of plum pocket and leaf gall mite on native plum, D. B. SWINGLE and H. E. MORRIS (*Rpt. Proc. Mont. State Hort. Soc.*, 19 (1916), pp. 29-34, figs. 3).—The authors give a short account of observations and tests for control of plum pockets, associated with *Taphrina pruni* and in later stages with a *Cladosporium* (which may also be parasitic), and on a leaf gall mite (*Eriophyes pruni*).

In this connection, they state that trees sprayed April 29 and May 7 with lime-sulphur were on June 24 comparatively free from galls. Trees sprayed for this trouble in 1915 with self-boiled lime-sulphur on April 23, May 7 and 26, and June 9 showed not over 1.35 per cent diseased fruits, while the check showed 55 per cent and other unsprayed trees ranged as high as 60 to 90 per cent. Recommendations include spraying with lime-sulphur at winter strength (sp. gr. 1.025 or 3.5° Baume) early in April or just when the buds begin to swell, and if the gall mite is present, with self-boiled lime-sulphur (S: S: 50) when the flower buds are in the pink, the treatment to be repeated when most of the petals have fallen.

Report on [citrus canker] eradication work for quarter ending December 31, 1917, F. STIRLING (*Quart. Bul. Plant Bd. Fla.*, 2 (1918), No. 2, pp. 130, 131).—Reporting further on citrus canker (E. S. R., 37, p. 556), the author states that up to December 31, 1917, citrus canker had been found in 22 Florida counties on 477 properties, 62 being still classed as infected. Three in one county still showed active infection, but none of these infections were considered as new. The number of infected trees ranged much lower during 1917 than during the three previous years, showing a maximum in April.

Citrus blast, R. W. HOBSON (*Quart. Bul. Plant Bd. Fla.*, 2 (1918), No. 2, pp. 123-130, figs. 3).—This is a brief account of the diseases of citrus trees which is said to be caused by *Bacterium citrarefaciens*, as described by Lee (E. S. R., 37, p. 154). It has spread with increase in virulence since 1915, until it now exists in all citrus-producing districts of northern and central California, though not yet known to be present in the southern part of the State.

A simple and effective method of protecting citrus fruits against stem end rot, J. M. ROGERS and F. S. EARLE (*Phytopathology*, 7 (1917), No. 5, pp. 361-367).—In a study of the rot organisms of citrus fruits, the authors found that over 83 per cent of the rot is caused by a species of *Diplodia*. Inoculation experiments showed that perfectly sound fruit in all conditions of maturity could be rotted down through the stem end if moisture conditions were favorable. The discovery of these facts led to an investigation of means of preventing the entrance of the organism to the stem end of the fruit.

Sealing the stem ends of the fruit was undertaken with very satisfactory results. By the application of shellac to the stem end of citrus fruits, it is claimed that the stem end rot may be prevented to a very considerable degree. For the treatment to be most effective, the fruit should be pulled and not clipped. Washing the fruit was found to increase the amount of decay to a great extent. It is thought that avocados, watermelons, and other fruits could possibly be protected from stem-end rot by the same treatment. A thin coating of paraffin over the fruit was found to prevent shriveling and drying and to keep the fruit from a month to six weeks longer than fruit not so treated.

Pulling fruit instead of clipping to prevent stem rot (*Cal. Citrogr.*, 3 (1918), No. 5, p. 100).—This refers to the article above noted regarding the measures recommended as lessening the amount of stem end rot of citrus fruits due to handling, and the possible applicability of these measures to other fruits.

Effect of disinfectants upon *Bacterium citri*, R. A. JEHLE (*Quart. Bul. Plant Bd. Fla.*, 2 (1918), No. 2, pp. 112-133, figs. 2).—The author gives an account of the methods and results of tests with various strengths of different disinfectants upon *B. citri*.

Susceptibility of noncitrus plants to *Bacterium citri*, R. A. JEHLE (*Phytopathology*, 7 (1917), No. 5, pp. 339-344, figs. 3).—Inoculation experiments with pure cultures of *B. citri* were made on various noncitrus plants to determine their susceptibility to citrus canker disease, particular attention being given to species belonging to the Rutaceae.

No infections were obtained from any of the experiments except in the case of the orange jessamine (*Murraya exotica*) and the wild lime (*Zanthoxylum fagara*). The author states that lesions have been occasionally noted on twigs of *Z. fagara* growing wild in Dade County, Fla., but no evidence has been secured of abundant natural infection of this plant with the bacteria of citrus canker.

Orange diseases, R. AVERNA-SACCA (*Bol. Agr. [Sao Paulo]*, 18, ser., No. 4 (1917), pp. 334-346, figs. 5).—This is mainly a discussion of gummosis (*Bacterium gummi*) of orange and related fruits in connection with their different degrees of susceptibility to the disease. Among the fungi noted in this connection are *Nectria* sp., *Myriangium citri*, and *Eutypa latibunda*.

A leaf blight of *Kalmia latifolia*, ELLA M. A. ENLOWS (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 3, pp. 199-212, pls. 4, figs. 2).—As a result of studies, carried on since 1914 in the Bureau of Plant Industry of the U. S. Department of Agriculture, on a leaf spot, or blight, of mountain laurel (*K. latifolia*), the author has isolated a fungus which has been shown to be parasitic and to cause the appearances described. The causal organism is described as a new species under the name *Phomopsis kalmia*.

A twig and leaf disease of *Kerria japonica*, V. B. STEWART (*Phytopathology*, 7 (1917), No. 6, pp. 399-407, figs. 7).—A description is given of *Coccomyces kerriae* n. sp., which is said to attack both the leaves and shoots of *K. japonica*. Cultural studies and inoculation experiments have been carried out with the fungus.

The occurrence of the fungus upon the host is first indicated by the appearance on the leaves of small discolored areas which soon become reddish-brown in color. The lesions may become confluent, involving a considerable portion of the leaf. When severely attacked, the leaves turn yellow, shrivel, and fall prematurely, but there is no shot-hole effect resembling that produced by certain species of *Cylindrosporium* on the leaves of other plants. On the shoots, the lesions are circular, reddish-brown to black in color, and vary from one

to several millimeters in diameter. In old lesions, portions of the cortical tissue may fall out, leaving the woody tissue exposed. Often the diseased areas are so abundant as to girdle the shoot completely.

No carefully conducted experiments seem to have been performed for the control of this disease, but the author states that preliminary tests made in 1916 indicate that a sulphur fungicide may prove effective in checking the trouble.

Investigation of bulb rot of narcissus.—I, The nature of the disease, E. J. WELSFORD (*Ann. Appl. Biol.*, 4 (1917), No. 1-2, pp. 36-46, figs. 5).—The author gives an account of infection experiments and other studies carried out with the various organisms which have been found in connection with bulb rot of narcissus. It is claimed that this trouble is not due to *Fusarium bulbigenum*, as held by Masee (E. S. R., 30, p. 354), but that it is caused by a nematode (*Tylenchus devastatrix*). A description is given of the symptoms and course of the disease, and precautionary measures are suggested.

Two new forest tree rusts from the Northwest, H. S. JACKSON (*Phytopathology*, 7 (1917), No. 5, pp. 352-355).—A description is given of *Chrysomyxa weirii* n. sp., occurring as a parasite on *Picea engelmanni*; and of *Melampsora occidentalis* n. sp., which has been collected on a number of species of *Populus*.

On a disease of the beech caused by *Bulgaria polymorpha*, R. J. TABOR and KATE BARRATT (*Ann. Appl. Biol.*, 4 (1917), No. 1-2, pp. 20-37, pl. 1).—The authors describe a serious gumming disease of old pollard beech trees at Burnham Beeches. Associated with the diseased condition was the fungus *B. polymorpha*, which also attacked old trees to which diseased bark or mycelium had been applied. Young trees, however, resisted completely the fungus in repeated tests.

Rhizina inflata, a root parasite of conifers, H. A. A. VAN DER LEK (*Tijdschr. Plantenziekten*, 23 (1917), No. 6, pp. 181-194, pls. 2).—A brief discussion is given of the known history, the several hosts, and the distribution of *R. inflata*.

Development of blister rust æcia on white pines after they had been cut down, W. A. McCUBBIN and G. G. POSEY (*Phytopathology*, 7 (1917), No. 5, pp. 391, 392).—The authors report the development on white-pine trees of blister rust æcia, the spores remaining viable six to eight months after the trees had been felled.

Preliminary report on the vertical distribution of *Fusarium* in soil, MINNIE W. TAYLOR (*Phytopathology*, 7 (1917), No. 5, pp. 374-378).—The author reports considerable trouble having been experienced with the damping-off of seedlings of *Pinus resinosa* and *P. ponderosa* caused by a species of *Fusarium* in the botanical gardens of Brown University, Providence, R. I. This led to a study of the vertical distribution of the fungus in seed beds, white-pine groves, and adjacent grasslands.

It was found that the *Fusarium* present occurred to a depth of 24 inches in the nursery soil, and it was present in more samples of soil from the nursery than from grassland. The fungus appeared in cultures from more samples in March than in the previous winter months, indicating a possible seasonal variation.

A canker of Eucalyptus, S. C. BRUNER (*Estac. Expt. Agron. Cuba Bol.* 37 (1917), pp. 33, pls. 8, fig. 1).—This is an account of studies carried out on a canker or rot of Eucalyptus noted near Habana and Santiago de las Vegas. The attacks develop on the trunk and larger branches. The causal organism is supposed to be a new species, and is described under the name *Diaporthe cubensis*. It is found to be cultivable on various media. The various species

of Eucalyptus are found to differ considerably as regards resistance to the fungus, some appearing to be completely immune.

Cause of the spike disease of sandal (*Santalum album*), R. S. HOLE (*Indian Forester*, 43 (1917), No. 10, pp. 429-442).—The author has studied spike of *S. album* in the forests of Coorg during two seasons and has tested the effect of various factors on the growth of sandal. He holds that the condition known as spike, which affects particularly *S. album* and *Zizyphus ænopia*, is induced by an unbalanced circulation of sap caused by a slowly decreasing water supply or any factor retarding growth or interfering with the translocation of organic food. This condition is claimed to be due to different factors, the operation of which in case of these two trees is discussed in some detail. These factors includes fires, the sole cause of spike in *Z. ænopia*, also for *S. album* death or severe injury of hosts, their partial suppression by other growths, and exposure of trees formerly grown under shade.

It is thought that the explanation here offered may prove to be applicable to such diseases as peach yellows and such factors as injudicious pruning.

Notes on wood-destroying fungi which grow on both coniferous and deciduous trees, II, J. R. WEIR (*Phytopathology*, 7 (1917), No. 5, pp. 379, 380).—In continuation of a previous report (E. S. R., 32, p. 54) the author lists additional collections of fungi found growing on both coniferous and deciduous trees.

ENTOMOLOGY.

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[Reports on economic entomology in India] (*Rpts. Agr. Research Inst. and Col. Pusa*, 1915-16, pp. 58-77, 78-84, 92-94; 1916-17, pp. 71-102, 111-117).—The reports here presented include for each year those of T. B. Fletcher as imperial entomologist and as imperial pathological entomologist, on the occurrence of and work with the more important insects of the year and on disease-carrying insects, ticks, etc., respectively, and of C. M. Hutchinson, imperial agricultural bacteriologist, on pebrine.

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Calcium arsenate v. lead arsenate, J. R. STEAR (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 156-158).—Attention is here called to the uniformly favorable results that have been obtained in the use of calcium arsenate, which, together with the fact that a considerable saving in cost can be effected, have led the author to advise that it be given a trial.

Practical suggestions regarding the fumigation of greenhouses, G. E. STONE (*Jour. N. Y. Bot. Gard.*, 17 (1916), No. 199, pp. 97-103; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 12, pp. 1858, 1859).—In experiments made in a greenhouse during the spring months five sets of cucumber plants were grown under cloth screens where the relative light intensity to which the plants were subjected was controlled for different intensities, but with all other conditions as nearly uniform as possible. The susceptibility to burning from fumigating with hydrocyanic acid gas was greatest in the plants developed under poor light conditions and the amount of burning decreased proportionately as the light conditions improved. Experiments were also made with cucumber plants grown in soils with varying percentages of soil moisture ranging from 10 to 70 per cent of their total water-retaining capacity.

"In respect to the influences of light alone, it appears that the largest and most vigorous plants were most resistant; but in respect to moisture supply the smaller, slow-growing plants that developed with the lower water supply were most resistant. Such results indicate clearly that the general conditions under which plants develop, or under which different organs such as leaves develop are of decided influence in determining the susceptibility of the plant or the organ. . . . Some plants are more susceptible to injury from fumigation than others. Plants with tender foliage or those that have been forced are more likely to suffer injury. The injury to any plant, however, may be greatly decreased or entirely obviated by the due consideration of the conditions of development and the daily periodicity of the plant's activity in the regulation of the dosage and the time of application."

A convenient type of hydrocyanic acid gas generator for fumigating vineyards for the destruction of the mealy bug (*Pseudococcus capensis*), C. W. MALLY (*So. African Jour. Sci.*, 13 (1917), No. 11, p. 621, pls. 2).—The author briefly describes and gives illustrations of a generator made of lead, the essential feature of which is a pair of tubes in the lid, one for the acid and the other for the cyanid solution.

Insect and other enemies of beans, E. R. DE ONG (*California Sta. Bul.* 294 (1918), pp. 344-347).—This is a brief summary of information on the more important bean insects in California and means for their control, including the bean weevil; horse bean weevil (*Bruchus rufimanus*), which feeds only on the horse bean; the red spider (*Tetranychus telarius*), a serious pest of all summer-grown beans, except Garbanzo and Blackeye; the bean thrips (*Heliothrips fasciatus*); the bean aphid (*Aphis rumicis*); flea-beetles; *Diabrotica* spp.; grasshoppers; and wireworms.

Insects and other animals attacking the cacao tree in the Belgian Kongo, R. MAYNE (*Roy. Belg. Min. Colon. Serv. Agr., Études Biol. Agr.*, No. 3 (1917), pp. 80, pls. 5, figs. 15).—A summary of information relative to the enemies of *Theobroma cacao*.

Some stone flies injurious to vegetation, E. J. NEWCOMER (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 1, pp. 37-42, pls. 3).—During the course of work by the Bureau of Entomology of the U. S. Department of Agriculture the author made studies of several western species of Plecoptera of the genus *Tæniopteryx*, including *T. pacifica*, *T. pallida*, and *T. nigripennis*, the members of

which, unlike other genera of the order, are equipped with well-developed mouth parts and feed upon the buds and leaves of plants.

Preliminary studies were made of one species in particular, *P. pacifica*, which has proved to be of considerable economic importance in Wenatchee Valley in central Washington where it is known as the "salmon fly." This species is of economic importance through its habit of appearing as the fruit buds are beginning to push out, eating large holes in them, and frequently destroying them entirely. Even where the injury is not so severe the blossoms and leaves developing from these buds are deformed and ragged. The ovary of the blossom is very often injured, resulting in deformed fruit. Later the insects feed on the calyxes and corollas of the blossoms, on the young fruit, and on the tender foliage. Apricots, peaches, and plums are the most seriously injured. Cherries are not so noticeably injured, the buds being harder and the young foliage sticky, while the damage to apples and pears is negligible, as their buds are tougher and they blossom later.

The injury by this stone fly was quite noticeable, especially in the lower part of the Wenatchee Valley, known as the Rock Island district, where there are extensive orchards near the Columbia River. In that district many growers reported it as seriously damaging their apricots and peaches, necessitating the discarding of much of the fruit. Examinations made of the shores of the Columbia River showed the flies to be emerging in large numbers, but they could not be found in the smaller streams.

While the press of other work prevented the carrying out of any extensive control experiments, it was observed in 1915 that plum trees which had been sprayed with crude-oil emulsion and nicotine sulphate for aphids were not as badly injured as those not sprayed. Examination on April 3, 1916, of an apricot orchard, part of which had been sprayed about April 1 with lead arsenate at the strength ordinarily used for the codling moth on apples (2 lbs. of lead arsenate to 50 gal. of water), at which time the buds were beginning to show green, showed 60 per cent of the buds to be injured, while only 24 per cent on the sprayed tree were injured, and it is quite probable that much of this latter injury was done before the sprays were applied, as the flies had been numerous for over a week.

Technical descriptions are given of its several life stages and of the mouth parts. Brief notes are presented on other species observed and native food plants fed upon.

An investigation of the scarring of fruit caused by apple red bugs, H. H. KNIGHT (*New York Cornell Sta. Bul.* 396 (1918), pp. 187-208, figs. 37).—The data here presented are based upon an extensive series of observations, commenced in 1914, on the production and development of scars caused by insects in order to make it possible for orchardists to recognize the scars on apples at picking time and the insects causing them and to deal more intelligently with such foes.

Gratifying results were obtained in studies made of the two red bugs, *Lygidea mendax* and *Heterocordylus malinus*, the present paper dealing chiefly with the injury produced by the former since it was found that *H. malinus* is practically negligible in the production of scars on the fruit. It was found that the different varieties of apples when injured by red bugs would develop different kinds of scars so a series of photographs was made for each of the commercial varieties, many of which are here presented to illustrate the variations, as well as those produced by the plum curculio combined with the rosy aphis (*Aphis sorbi*) and frost, lime-sulphur spray, rubbing against limbs, pin punctures, etc.

Certain varieties of apples are more subject to fatal injury than are others, thus the Twenty Ounce and varieties of pippin, which develop rapidly, can with-

stand or recover from wounds that cause the dropping of slow-growing varieties, such as the Northern Spy. "If the core of the young apple is punctured by feeding red bugs, the flesh of the fruit never grows back at the point of puncture and a deep pit results in the mature apple."

The work is presented under the headings of growth of fruit in relation to time of injury, a factor in the type of scar developed; development of *L. mendax* in relation to the growth of the tree and the fruit; red-bug injury combined with injury by rosy aphids; varieties of apples injured by *L. mendax*; warting of scars; injuries that may be confused with red-bug injury; scars produced by frost injury; scars produced by spray injury; mechanical injuries; experiments in producing scars by pin punctures; notes on the control of *L. mendax*; etc.

The varieties of apples most affected by *L. mendax* in Genesee County were found to be, in the order of greatest injury suffered, Rhode Island Greening, Northern Spy, Baldwin, Roxbury, Tolman, Tompkins King, Maiden Blush, Twenty Ounce, Esopus, and Fall Pippin.

The false apple red bug, H. A. GOSSARD (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 153-155, figs. 3).—A popular summary of information on *Lygidea mendax*.

Suggestions for a new method of destroying chinch bugs, W. P. FLINT (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 186-188).—A brief report of experiments which show that it is possible to destroy chinch bugs in large numbers by the use of soluble poisons.

Notes on the woolly aphid, G. G. BECKER (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 245-255, pl. 1).—This is a report of biological studies conducted in the Ozarks in Arkansas.

"The life history of *Eriosoma lanigera* in the Ozarks is the same as recorded for Maine and for Vienna, Va., with the exception that there are probably more than two generations of apterous viviparæ on apple and *Cratægus*. Experiments with apple root forms indicate that there may be from six to twelve generations a year in the Ozarks. Elms have acquired a strong degree of immunity to this species. Susceptibility to attack seems to be correlated with backwardness of growth in the spring. *Cratægus crus-galli* is largely immune to the insect, the condition of immunity being apparently inherent in some instances and conditional in others. Northern Spy stock is immune to the species. Apterous viviparæ from *Cratægus* will establish on apple and apterous viviparæ from apple will establish on *Cratægus*, though the *Cratægus* individuals do not establish as readily on apple as do the individuals from the same host.

"Based on a study of the antennæ, the writer's data indicate that *E. crategi* Oestlund is a synonym of *E. lanigera* Hausmann."

Some factors influencing the distribution of *Pemphigus betæ* in beet fields, A. C. MAXSON (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 231-236).—A report of studies of the beet aphid in Colorado.

Concerning the discovery of a food plant of the silkworm, H. FUJIMA (*Bul. Assoc. Séri. Japon.* No. 24 (1917), pp. 1-6, pls. 2).—The author reports feeding experiments with *Lactuca brevisrostris*, which show it to be a valuable food plant for the silkworm.

The pink bollworm (*Gelechia gossypiella*) in Egypt, H. A. BALLOU (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 236-245).—A report upon biological and control work with the pink bollworm (*[Gelechia] Pectinophora gossypiella*) conducted by the author in Egypt.

Municipal control of the spring cankerworm, S. J. HUNTER (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 164-167).—An account of control work conducted by

the city of Lawrence, Kans., in the eastern half of which State the spring cankerworm has been unusually abundant and destructive the past two years, both in the cities and in the native woods. The biological studies conducted are also noted from another source on page 255.

Further notes on *Laspeyresia molesta*, W. B. WOOD and E. R. SELKREGG (*Jour. Agr. Research* [U. S.], 13 (1918), No. 1, pp. 59-72, pls. 6).—This is a report of investigations of the oriental peach moth by the Bureau of Entomology of the U. S. Department of Agriculture at Rosslyn, Va., in continuation of those previously noted (E. S. R., 36, p. 358).

It has been found that an insect doing considerable injury to peaches and pears in Japan is no other than this insect, specimens sent to this country having been identified as *L. molesta*. It is pointed out in the introduction that owing to the number of generations which develop in a single season it is particularly hard to control, and this fact, together with its wide range of food plants, would seem to make it a pest of as great importance as its near relative, the codling moth. In addition to the host plant previously recorded, including peach and the various cultivated species of *Prunus* (cherry, plum, apricot, and several varieties of flowering cherries), this moth has been reared from quince, pear, apple, and flowering quince, and has been found to attack quince and apple almost as readily as the peach and the injury caused undoubtedly would be very severe in a large plantation. The quince appears to be the favorite food plant of the pome fruits. In addition to the District of Columbia and adjacent territory, it is known to occur in northern New Jersey, New York City, Long Island, and Stamford, Conn., but with the exception of the vicinity of Washington, D. C., the fruit-growing industry is unimportant in all the localities where it occurs.

It causes two distinct types of injury, one to the twig and the other to the fruit, the nature of which is considered at some length. The injury to the twigs is particularly severe on young trees and occurs mostly before midsummer, while the twigs are yet soft; the injury to fruit does not become severe until after August 1. Among the insects mentioned as likely to be confused with the oriental peach moth in the larval stage, either because of a close resemblance or because of a similarity in the injuries which they cause, are the codling moth, the lesser apple worm, the peach twig borer, and *L. pyricolana*.

In life history studies made during 1917 near Rosslyn, it was found that the hibernating larvæ pupate in mid-March and commence to emerge about mid-April, when peaches are in full bloom, continuing through the first three weeks of May. The preoviposition period ranges from 2 to 12 days with an average of 5 days, the first eggs being found in a peach orchard on May 3. Oviposition began May 2 and continued until late in the fall, the last egg observed being found October 8. Normally the eggs are deposited singly on the underside of the leaves and in the orchard they were not found in any other place. The average incubation periods of the eggs of the first three generations were 7.5, 4, and 3.1 days, respectively, for the fourth and fifth generations, collectively, 8.3 days.

"When the young larva hatches it immediately starts on its search for a favorable feeding place. In one instance 20 minutes were required after hatching for a larva to explore three peach leaves and to make its way to the tender growth at the terminal, where it bored into the interior of the peach shoot. The larvæ do not feed as they enter but withdraw their heads from the burrow and cast aside the fragments of tissue until the more succulent interior of the twig is reached. If the young larvæ fail to locate favorable feeding places in a short time, they undoubtedly die, for in the rearing jars they die within 12 hours after hatching."

The feeding period ranges from 8 to 16 days in length throughout the entire season, the average for 59 larvæ being 11.2 days. When fully developed the larva leaves the twig or fruit where it has been working and starts in search of a favorable place for spinning its cocoon. The spring and midsummer cocoons are formed mostly in the axils between twigs or on the fruit at a point where it is attached to the stem. The time from spinning the cocoon to pupation is from 2 to 9 days, with an average of 3 days. The pupa period covers from 5 to 12, with an average of 7.8 days. In 1917 the adults emerged from April 16 to October 30, though only a few straggling individuals emerged after October 5. The number of eggs deposited in rearing jars varied from 1 to 391. Technical descriptions are given of its life stages.

The winter is passed in the larva stage in cocoons formed in the autumn after the larvæ are fully developed. In the peach orchard a large percentage of overwinter insects spin their cocoons in small cracks in the bark, under bark flakes, and in curled ends of bark strips on the trunk and large branches of the trees.

Eight species of hymenopterous parasites, six of which are primary and two secondary parasites, and one dipterous parasite, *Hypostena variabilis*, have been reared. Of the primary hymenopterous parasites, *Macrocentrus* sp., also parasitic on the codling moth, attacks and develops within feeding larvæ, spinning its cocoon within the cocoon of the host, and is the most abundant. *Phaeogenes* sp., which emerges from the pupæ of the host and probably attacks the insects in the prepupa or pupa stage, was second in abundance. Several specimens of *Ascogaster carpocapsæ* were reared, as was one specimen each of *Spillocryptus* sp., *Mesostenus* sp., and *Glypta vulgaris*.

In control work arsenate of lead, though applied to the fruit, foliage, and twigs just before the eggs were due to hatch, did not prevent the larvæ from entering the twigs and fruit and gave no degree of control. Other applications in addition to this one, made at such times as it was thought the insect would be most vulnerable to attack, gave no better results in control. A 40 per cent nicotine sulphate solution, diluted to 1 part in 400 parts of water and applied in the same way and at the same time as the treatments with arsenate of lead did not control the insect, although counts made early in the season of the number of infested twigs on the sprayed and unsprayed plats seemed to indicate slight benefit from the treatment. A combination spray of lead arsenate and nicotine sulphate likewise gave negative results. Banding the trees with burlap resulted in the capture of a few larvæ, but most of the insects after leaving the twigs and fruit spin their cocoons around the fruit spurs, on the peaches, and in the axils of the twigs, thus making this operation a failure. Clipping the infested twigs from the trees and destroying them and destroying infested fruit gave partial control, but was too laborious to be practical.

Tests made of the killing power of miscible oils and nicotine sulphate when applied to the cocoons containing overwintering larvæ and directly to the insects by immersing them in the liquid resulted in the destruction of about two-thirds. Similar tests were made using 40 per cent nicotine sulphate at a dilution of 1:233 combined with the oil solution used above gave somewhat similar results. Fumigation tests with hydrocyanic acid gas made on overwintering larva in cocoons at the rate of 1 oz. of sodium cyanid to 100 cu. ft. of space for a period of 1 hour failed to kill the larvæ. The same results were obtained from fumigation in a 25-in. vacuum at the same and double the strength and time period. Thus it appears that it is impossible to free infested nursery stock of this insect by dipping or fumigation.

The oriental peach pest (*Laspeyresia molesta*), a dangerous new fruit insect of Maryland, P. GARMAN (*Maryland Sta. Bul.* 209 (1917), pp. 16, figs.

25).—This is a report of studies of the oriental peach moth, made at College Park, Md., which is about 11 miles east from the place at which the studies by Wood and Selkregg, above noted, were conducted.

The author found the pest at College Park on peaches, apples, plums, and apricots. "The injury is confined largely to twigs, growing tips being the favorite food. As high as 90 to 100 per cent of all terminal buds may be killed, though as a rule only 50 to 70 per cent are destroyed. When the fruit begins to ripen or is partly grown, the larva frequently leaves the twig and enters the peach near the stem. The percentage of fruit infested has been found to vary from 5 to 15 per cent and the damage to the fruit may not, therefore, be considered as serious, certainly not as serious as the damage to younger trees where a general stunting of the growth of the tree results and a bushy growth takes place instead of a more desirable one."

"The egg, like that of the codling moth, is deposited usually at a considerable distance from the initial feeding point of the larva, on the underside of the leaf, frequently on leaves as far below the tip as the fifth or sixth, a distance as far as 6 in. from its suitable food. The incubation period in midsummer may be as short as 4 or 5 days. From 8 to 13 days with an average of 11 days was obtained as the length of the larval period. Larvæ obtained from eggs laid later than August 25 hibernated in cocoons after September 1 and did not pupate. The length of the pupal period during the growing season varies from 9 to 13 days with an average of 10 days and the life cycle is completed in about 26 days. A monthly recurrence of the larval infestation of the twigs takes place, the earliest noted infestation of the twigs occurring in the field on May 22, which means the possibility of four broods during the season, provided a warm September is experienced. During 1917, however, the fourth brood was cut short by a cold September, when the temperature fell nearly to 60° F."

Descriptions are given of the life stages of the moth and the manner of distinguishing it from several similar pests pointed out. Its distribution in Maryland at the present time is confined to counties adjacent to Washington and Baltimore. It has not been seen on the Eastern Shore or in the peach-growing districts of the mountainous western counties.

Two hymenopterous parasites have been observed by the author, *Trichogramma minutum*, which attacks the eggs and is the most important, and *Macrocentrus* sp., which has been reared from the larva, though not in excessive numbers.

The life-history studies show the most vulnerable stage to be that of the egg or earlier larval stages because of the position of the egg and its distance from the initial feeding ground of the larva. It is impossible to keep the young twigs coated with arsenical poison, but it is possible to prevent the larvæ from entering the fruit by a thorough application. Care must be taken to coat the undersurfaces of the leaves in order to kill the egg or young larva. The pupa, so far as known, can not be effectively destroyed owing to the character of the cocoon, but winter sprays of lime-sulphur and, perhaps, others may prove important as control measures.

The author's experiments indicate that twig injury may be reduced but slightly by application of the usual insecticides. The most successful combination during 1917 was a mixture of self-boiled lime-sulphur, calcium arsenate, and tobacco, preceded by a winter application of concentrated lime-sulphur. Applications were made on April 30, May 24, June 15, and July 13, the concentrated lime-sulphur having been applied previous to April 30. This treatment gave a reduction of 31 per cent in twig injury, as compared with a

reduction of 24 per cent obtained from the use of the concentrated lime-sulphur alone. Applications of nicotin and soap and nicotin and atomic sulphur showed no decrease in the amount of infestation over check plats. The results of spraying tests for the control of the oriental peach pest, as determined by twig counts, are given in tabular form.

The author's recommendations for control are as follows: "Winter applications with concentrated lime-sulphur should not be omitted. Calcium arsenate, 0.5 lb. to 50 gal., is recommended for summer use if combined with self-boiled lime-sulphur and nicotin. If self-boiled lime-sulphur is not used, freshly slaked lime, 4 lbs. to 50 gal. of mixture, should be added. It should not be used with atomic sulphur unless slaked lime is added. Applications should be made at monthly intervals, the first application of arsenate with the dropping of the bloom; the number of applications to be not less than three. This means a modification of the usual program, which should conform more closely to that used for apple. The following is suggested: Concentrated lime-sulphur (1:9) when the buds swell; self-boiled lime-sulphur (8:8:50) plus arsenate and nicotin after the petals fall; the same mixture to be applied 2, 8, and 12 weeks later. Summer sprays should be carefully applied to the undersurfaces of the leaves in order to kill the eggs or young larvæ. Applications of tobacco (nicotine sulphate or blackleaf 40) and soap can not be recommended for control of the oriental peach pest."

Irregular emergence of codling moth at Hood River, L. CHILDS (*Better Fruit*, 12 (1918). No. 8, pp. 10, 12, 13, 16, fig. 1).—In this paper the author gives a brief summary of observations of the codling moth at Hood River, Oreg., during the years 1914-1917, inclusive, of which a report covering the earlier work has been previously noted (E. S. R., 35, p. 551).

These observations have shown that there is a very decided variation in the emergence of the broods from one season to another under the climatic conditions of this section. They emphasize the need for the establishment of observation stations to obtain information on the insect's seasonal activity in the widely separated apple-growing sections of the State for use by orchardists in planning their spraying programs. The necessity for such stations in Illinois has previously been pointed out by Forbes and Glenn (E. S. R., 36, p. 853).

Seasonal irregularities of the codling moth, L. CHILDS (*Jour. Econ. Ent.*, 11 (1918). No. 2, pp. 224-231).—This paper, which relates to the investigations noted above, includes a brief résumé of the observations that have been made relative to the behavior of the codling moth at Hood River, Oreg., during the years 1914, 1915, 1916, and 1917.

The codling moth (*Carpocapsa pomonella*), H. R. HAGAN (*Utah Sta. Circ.* 30 (1918), pp. 4, figs. 2).—A popular summary of information.

A study of the Japanese Lasiocampidæ and Drepanidæ, K. NAGANO (*Bul. Nawa Ent. Lab. [Japan]*, No. 2 (1917), pp. 3+45+140, pls. 10, figs. 9).—Eighteen forms of Lasiocampidæ and 27 of Drepanidæ are recognized by the author as occurring in Japan. Two genera each of Lasiocampidæ and of Drepanidæ are erected and three species of Lasiocampidæ are described as new.

The clover seed midge, H. A. GOSSARD (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 150-152, fig. 1).—This is a popular summary of information on *Dasyneura leguminicola*.

The mosquitoes of Colorado, T. D. A. COCKERELL (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 195-200).—A summary of information on the occurrence of mosquitoes in Colorado, in which notes are presented on 17 species thus far identified from Colorado or Wyoming.

Dengue fever, C. C. McCULLOCH (*New Orleans Med. and Surg. Jour.*, 70 (1918), No. 9, pp. 694-706).—In discussing the transmission of this disease, it

is pointed out that the status of species of mosquitoes, other than *Culex fatigans* which may carry the disease, has not been fully determined. The quite constant association of *C. fatigans* in large numbers with dengue indicates that it is probably the principal species concerned, though Brooks has stated that in one epidemic which he observed [*Stegomyia*] *Aedes calopus* was the only mosquito present. In Australia in 1916 *A. calopus* was proved experimentally to act as the vector.

Dengue fever in Australia.—Its history and clinical course, its experimental transmission by *Stegomyia fasciata*, and the results of inoculation and other experiments, J. B. CLELAND, B. BRADLEY, and W. McDONALD (*Jour. Hyg. [Cambridge]*, 16 (1918), No. 4, pp. 317-420, figs. 9).—In dealing with mosquito transmission it is pointed out that epidemic dengue fever in Australia is approximately coextensive with the known distribution of *Aedes calopus* [*S. fasciata*]. *A. calopus* mosquitoes caught in a dengue infected district in the surroundings of cases of the disease, and some of them known to have fed on a dengue patient on the first and second days of his illness, when transported to a nondengue district reproduced the disease in four out of seven persons on whom biting experiments were conducted. Blood taken from three of these four cases reproduced the disease when injected into noninfected individuals, the blood of one case not being tested. No evidence was obtained from two cases, one of which was heavily and repeatedly bitten, that *Culex fatigans* is capable of acting as a transmitter of dengue fever.

Overwintering of the house fly, R. H. HUTCHISON (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 3, pp. 149-170, pl. 1).—This is a report of investigations by the Bureau of Entomology of the U. S. Department of Agriculture, commenced in the fall of 1914 at the Arlington Experimental Farm and continued during the two seasons of 1915-1917 at Bethesda, Md., which have led the author to draw the following conclusions:

"In the latitude of Washington, D. C., the house fly may overwinter in two ways: (1) By continued breeding in warm places where food and media for deposition are available, and (2) in the larva and pupa stages in or under large manure heaps. There is no evidence whatever to show that house flies do or can persist as adults from November to April either outdoors, in protected stables, or in attics or heated buildings. Temperatures of 12 or 15° F. are quickly fatal, and there is every reason to believe that any temperature below freezing is fatal if continued long enough. In heated buildings their life is not prolonged beyond that of summer at like temperature, nor is there any suspension or retardation of sexual development or activity.

"It is known that house flies continue to emerge from manure heaps as late as the first week in December. Many of these late forms will find their way on mild days to heated buildings, and those which do not are quickly killed. . . . When food is available they may continue alive through December and January, and even into February, if not destroyed by fungus attacks. But there are neither experiments nor observations to show that they can continue throughout the winter until temperatures are again favorable for outdoor activity and egg laying. If flies find access in the autumn to heated buildings, where both food and media for deposition are available, such as animal houses or restaurants in which sufficient attention is not given to the disposal of garbage or kitchen wastes, they will continue breeding throughout the winter. In such cases the flies present in March and April are the offspring, not the survivors, of those which found their way to such places the preceding autumn. It is probable that this method of overwintering is much more widespread than is now realized, especially in cities where there must be several foci from which

flies escaping on warm days in March and April survive to produce the hordes that begin to appear late in May.

"The possibility of house flies overwintering in the larva and pupa stages has been demonstrated at Washington, D. C., and at Columbus, Ohio, as well as for the milder regions of Texas. But whether this method of overwintering in these stages or by continued breeding is the more common or more successful can not now be stated. To judge from experiments with larvæ and pupæ, and from the fact that house flies do not appear in large numbers until late in May or early in June, it would seem that only a very small percentage of larvæ which are present in manure heaps in the autumn live through the winter and give rise to the adults in the spring."

A list of 18 references to the literature is included.

On the life history of *Sarcophaga eleodis*, G. W. BARBER (*Jour. Econ. Ent.*, 11 (1918), No. 2, p. 268).—The author records observations at Maxwell, N. Mex., of the larviposition of *S. eleodis* on *Eleodes obsoleta*, followed by the entrance of the larva into its host through the anal opening. "The beetle thus attacked lived for 13 days, dying on September 26, and on September 28 the full-grown larva issued, breaking off the head of the host in doing so. On March 12 the larva had entered the pupa stage, from which the adult fly emerged on April 3, 1917."

Notes on some southwestern Buprestidæ, H. E. BURKE (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 209-211).—This paper gives the host plants and some biological notes on 18 species of flathead borers (buprestid larvæ) mostly from Sabino Canyon, Santa Catalina Mountains, Ariz.

The southern corn rootworm and farm practices to control it, P. LUGENBILL (*U. S. Dept. Agr., Farmers' Bul.* 950 (1918), pp. 10, figs. 7).—A popular summary of information relative to this pest and means for its control. An account of this pest by Webster has been previously noted (*E. S. R.*, 30, p. 56).

Common white grubs, J. J. DAVIS (*U. S. Dept. Agr., Farmers' Bul.* 940 (1918), pp. 28, figs. 21).—A revision of Farmers' Bulletin 543 (*E. S. R.*, 29, p. 561).

Control of the striped cucumber beetle, H. D. BROWN (*Illinois Sta. Circ.* 220 (1918), pp. 4, fig. 1).—A popular summary of information.

The alfalfa weevil (*Phytonomus posticus*), H. R. HAGAN (*Utah Sta. Circ.* 31 (1918), pp. 8, figs. 10).—A popular account.

Important clover insects, H. A. GOSSARD (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 4, pp. 104-106, fig. 1).—This article, which is the first of several to be issued on the control of clover-feeding insects, gives a popular summary on the clover-leaf weevil (*Hypera punctatus*).

The avocado weevil (*Heilipus lauri*), A. S. HOYT (*Quart. Bul. Plant Bd. Fla.*, 2 (1918), No. 2, pp. 108-112, figs. 3).—A brief account in which the importance of this pest is emphasized.

Wintering bees in Tennessee, C. E. BARTHOLOMEW (*Col. Agr. Univ. Tenn., Ext. Div. Pub.* 53 (1917), pp. 8, figs. 5).—A popular summary of information.

Fertilization of queen bees, C. W. HOWARD and L. V. FRANCE (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 265-267).—The authors report upon their experiments in the artificial fertilization of queen bees, which indicate that if the mating of queen bees is to be controlled it must be done in some way other than that which they followed.

Important factors in the spread and control of American foul brood, E. D. BALL (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 200-205, fig. 1).—A discussion, based particularly upon Wisconsin conditions.

Finely powdered mercuric chlorid for the destruction of the Argentine ant (*Iridomyrmex humilis*), C. W. MALLY (*So. African Jour. Sci.*, 13 (1917),

No. 11, pp. 565-567).—The author has found that a cordon of finely ground corrosive sublimate about 0.5 in. in width placed around the entrance to the nest will result in the destruction of the ants. "When the sublimate has been sprinkled on the soil at any point, it remains sufficiently virulent to affect the ants for a long time. Certain protected spots treated eight or nine months ago still react on the ants when they wander over them. Heavy rains carry the corrosive sublimate away to a very large extent, but light rains simply carry it into the soil, and then, as the moisture evaporates, there is a tendency for the corrosive sublimate to be deposited on the surface, thus reproducing 'ant-tape' conditions. This suggests that it may be possible to treat the foundations of buildings, either during construction or afterwards, with corrosive sublimate in solution, and fortify them against ant invasion."

An emergence response of *Trichogramma minutum* to light, G. N. WORCOTT (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 205-209).—In work with the sugarcane borer at Harlingen, Tex., during the summer of 1917, 944 of 1,506 clusters of eggs, or 62.7 per cent, were found to be parasitized by *T. minutum*. The average of 35 experiments shows that 6.19 times as many adults of *T. minutum* emerge in the first hour after being exposed to daylight as emerge in the dark per hour of previous daylight in the same day.

Eupelminus saltator as a parasite of the Hessian fly, W. R. MCCONNELL (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 168-175, fig. 1).—During the course of studies of parasites of the Hessian fly the author has reared a wingless species as yet unrecorded in American literature, namely, *E. saltator*. An account of studies of this species at Hagerstown, Md., during the season of 1916 are presented.

It is a primary parasite of the Hessian fly, attacking externally both larval and pupal hosts inside the puparium. In the laboratory the average time required for its development varied greatly with the season, the shortest period recorded being 15 days during July. Five generations were reared in the laboratory during 1916 between April and September and a sixth generation overwintered and emerged the following May. While up to the present time *E. saltator* has been of inconsiderable importance in the natural control of the Hessian fly, during the period of observation there has been no extensive outbreak either of the Hessian fly or its alternate host, *Harmolita (Isosoma)* spp. It has been reared by the author from nine localities in Pennsylvania, from two in Maryland, and two in Virginia, and by W. J. Phillips from *Harmolita* material from Michigan, Indiana, Ohio, New York, Pennsylvania, and Virginia.

Note on the development of *Trichogramma evanescens*, J. B. GATENBY (*Quart. Jour. Micros. Sci. [London]*, n. ser., 62 (1917), No. 248, pp. 613, 614).—This consists of corrections of errors in the paper previously noted (*E. S. R.*, 37, p. 856).

Some results of two years' investigations of the Rocky Mountain spotted fever tick in eastern Montana, R. R. PARKER (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 189-194).—In this paper the author considers the abundance of ticks (*Dermacentor venustus*), wild mammals as tick hosts, and relation of the character of the country to the abundance of host animals and of ticks.

The chigger mites affecting man and domestic animals, H. E. EWING and A. HARTZELL (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 256-264, fig. 1).—The authors find that six separate and distinct mites taken from man and domestic animals have been accurately described, figured, and named, of which three are found in Europe, two in the East Indies, and one in Mexico. In this country at least two distinct chigger mites are known to attack man, but the specific identity remains to be worked out.

FOODS—HUMAN NUTRITION.

Experiments on the digestibility of fish, A. D. HOLMES (*U. S. Dept. Agr. Bul. 649 (1918), pp. 15*).—In the study of the digestibility of the protein and fat supplied by some common varieties, fish in the form of "fish loaf" was served as the major part of a simple mixed diet, which also included potatoes, crackers, fruit, sugar, and tea or coffee. The results are summarized as follows:

Results of digestion experiments with fish.

Number of experiments.	Kind of fish.	Average amount of fish eaten per man per day.	Digestibility of fish protein.	Digestibility of fish fat.
		Grams.	Per cent.	Per cent.
3.....	Mackerel.....	448	93.1	95.2
3.....	Butterfish.....	471	91.9	86.4
8.....	Grayfish.....	440	92.8	94.3
4.....	Salmon.....	355	93.2	93.7

"Considering the experiments as a whole, the very complete utilization of the protein and fat supplied by the fishes studied offer additional experimental evidence that fish is a very valuable food and that its extensive use in the dietary is especially desirable."

A biological analysis of pellagra-producing diets.—I. The dietary properties of mixtures of maize kernel and bean, E. V. McCOLLUM and NINA SIMMONDS (*Jour. Biol. Chem., 32 (1917), No. 1, pp. 29-61, figs. 24*).—Continuing previous work (*E. S. R., 37, pp. 61, 163*), the present series of papers describes an inquiry with respect to the several dietary factors of diets consisting of the important food materials (except milk and eggs) in use in the United States. The first paper of the series describes the addition of purified food substances which must be made to combinations of the maize kernel and the navy bean to make these mixtures dietetically complete. The conclusions reached were as follows:

Like each of the two seeds individually the mixtures contain too small an amount of the "fat-soluble A" to induce optimum well-being in growing animals. The mixtures furnish a great abundance of "water-soluble B."

The most satisfactory protein mixture is found in about 80 per cent of maize and 20 per cent of beans. Such a mixture has about one-half the biological value that the total protein mixture in milk possesses.

The deficiencies of the maize and bean mixture consist in its mineral content of calcium and sodium and makes important the addition of milk or the leaves of plants.

Composition of California bean varieties, M. E. JAFFA and F. W. ALBRO (*California Sta. Bul. 294 (1918), pp. 341, 343*).—Analyses of 16 varieties of California beans are reported. The average composition of the seed is reported as follows: Water 9.91 per cent, ash 4.11, protein 20.84, fat 2.26, fiber 4.25, and nitrogen-free extract 58.62 per cent. The average composition of the straws was water 11.07 per cent, ash 6.97, protein 5.68, fat 1.52, crude fiber 41.1, and nitrogen-free extract 33.63 per cent; and of the pod, water 10.46 per cent, ash 7.38, protein 4.29, fat 1.15, crude fiber 30.42, and nitrogen-free extract 46.3 per cent.

Wheatless recipes from Washington headquarters (*Hotel Mo., 26 (1918), No. 302, pp. 60-65*).—A collection of wheatless recipes sent out by the Food

Administration to the hotel and restaurant keepers who pledged themselves to use no wheat until next harvest.

Use barley—save wheat (*U. S. Dept. Agr., Office Sec. Circ. 111 (1918), pp. 4*).—Recipes tested by the Office of Home Economics of the States Relations Service for the use of barley flour in place of wheat flour in quick breads, pastry, cakes, and cookies are given.

Use peanut flour to save wheat (*U. S. Dept. Agr., Office Sec. Circ. 110 (1918), pp. 4*).—This circular, which is a contribution from the States Relations Service, contains tested recipes for the use of peanut flour made by grinding the press cake resulting from the expression of peanut oil.

Use soy-bean flour to save wheat, meat, and fat (*U. S. Dept. Agr., Office Sec. Circ. 113 (1918), pp. 4*).—The soy bean press cake, which still contains some oil and all the rest of the food material originally present in the beans, "is readily ground into flour, which is of high food value and can be used in many ways in cooking." Recipes, tested by the Office of Home Economics of the States Relations Service, for the use of soy-bean flour are given.

A neglected source of valuable human food.—Cottage cheese can partly replace meats in human diets, A. E. PERKINS (*Mo. Bul. Ohio Sta., 3 (1918), No. 4, pp. 128-134*).—The desirability of making more cottage cheese from the skim milk and buttermilk on the farm is discussed. The fact that cottage cheese can be used in place of meats in human diets is emphasized. It is also pointed out that the whey from making cottage cheese can be successfully used for stock feeding in place of the skim milk. Suggestions for making and marketing cottage cheese are included.

Cottage cheese dishes (*U. S. Dept. Agr., Office Sec. Circ. 109 (1918), rev. ed., pp. 19, figs. 7*).—Recipes for many ways of serving cottage cheese and utilizing the whey are given.

Savings and savory dishes (*London: A. & C. Black, Ltd., 1917, pp. 139*).—A collection of pamphlets issued originally by the Patriotic Food League of Scotland. These pamphlets are designed to give hints on household economy in all matters relating to food with particular reference to war conditions. Menus and recipes are included.

[Miscellaneous food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 2, pp. 21, 27-36*).—A report of the foods, beverages, and drugs recently analyzed is discussed.

Food surveys (*U. S. Dept. Agr., Bur. Markets, Food Surveys, 1 (1918), No. 1, pp. 7*).—This, the initial number of this periodical, reports data as to the food surveys carried on by the Bureau of Markets and indicates the commercial stocks of important grains and grain food products in the United States on April 1. The data relates to the stocks in elevators and grain warehouses, general warehouses, grain mills, and those in the hands of wholesale grain dealers.

The commercial stocks of wheat on April 1, 1918, were apparently only 37.9 per cent of those on April 1, 1917, while those of white wheat flour were 82.9 per cent. With the exceptions of oats and buckwheat flour the stocks of the other commodities show considerable increase.

Diet standards for hard work: Supplementary rations (*Lancet [London], 1918, I, No. 12, pp. 443, 444*).—It is announced that the British Ministry of Food has decided to issue supplementary rations for all persons classed as heavy workers, i. e., those engaged in heavy industrial or agricultural work. The scheme does not provide an increase in the allowance of butcher's meat, but a supplementary ration, for which cards will be issued, limited to bacon, rabbits, poultry, and meat other than butcher's meat. "The increased allowance will amount approximately to an advance of 50 per cent on the ration

upon which the supply of meat food to the population of London and neighboring counties is now based. . . . A limited number of women will share the same extra allowance of food provided their work is more strenuous than that implied by 'ordinary' factory work not involving exceptional physical exertion or exposure to heat or weather. . . . Professional workers are excluded from the scheme whatever the strain upon their actual muscular powers."

ANIMAL PRODUCTION.

The rural efficiency guide.—IV, *Stock book*, G. C. HUMPHREY (*Cleveland, Ohio: The Peoples Efficiency Pub. Co., 1918, pp. [IX]+448, pls. 4, figs. 332*).—This volume deals with the following subjects: Live stock breeding and management (pp. 1-5), cattle production (pp. 7-60), diseases of cattle and treatment (pp. 61-100), horse production (pp. 101-138), diseases of horses and treatment (pp. 139-181), sheep production (pp. 183-199), diseases of sheep and treatment (pp. 200-212), swine production (pp. 213-233), and diseases of swine and treatment (pp. 234-272); includes a section, by Florence Forbes, on poultry raising, and diseases and treatment (pp. 273-402); and gives miscellaneous information of interest to stock breeders.

Proceedings of the Cut-over Land Conference of the South (*Proc. Cut-over Land Conf. South, 1917, pp. 244*).—At this meeting, held in New Orleans, April 11-13, 1917, the employment of live stock as a very important factor in utilizing and building up the cut-over pine lands of the South was emphasized. Papers bearing especially on this phase of the subject are as follows: Experiences in Cattle Raising on Cut-over Lands, by F. B. Enochs (pp. 93-96); Beef Cattle and Hogs, by G. M. Rommel (pp. 112-125); A Survey of the Live-stock Situation, by A. M. Soule (pp. 125-141); The Animal Industry of the South—Past, Present, and Future, by W. H. Dalrymple (pp. 142-150); Demonstration Work on Cut-over Lands, by G. E. Nesom (pp. 157-168); The Dairy Industry of the South, by C. W. Radway (pp. 174-178); Some Suggestions for Dairying on Cut-over Lands, by N. P. Hull (pp. 179-181); Tick Eradication, by E. I. Smith (pp. 182-187); The Sheep Industry of the South, by F. R. Marshall (pp. 196-201); and Forestry and Cattle Raising on the Cut-over Pine Lands of the Southern States, by J. G. Lee (pp. 217-225).

Proceedings of the Farmers' Annual Normal Institute and spring meeting of the State Board of Agriculture, compiled by C. E. CAROTHERS (*Penn. Dept. Agr. Bul. 300 (1917), pp. 205*).—Among others, papers were presented on the following subjects: Selecting Heavy Laying Hens by External Characters, by W. T. Wittman (pp. 68-72); Beef Production in Pennsylvania, by J. A. Herr (pp. 76-78); and Problems in Pork Production, by F. C. Minkler (pp. 89-106).

Receipts and shipments of live stock at the Kansas City stock yards for the year 1917 with summary for the years 1871 to 1917 (*Ann. Live Stock Rpt., Kansas City Stock Yds., 1917, pp. 31*).—The receipts of cattle for the year were the largest in the history of the yards, namely, 2,640,145 head. The record was also broken for horses and mules, the number received being 127,823 head. There was a large increase in the number of calves received over the year 1916 and a decrease in the number of hogs and sheep.

The live stock situation from the marketing standpoint, H. S. ARKELL (*Ontario Dept. Agr. Bul. 246 (1917), pp. 21-23*).—Attention is called to the importance of the live-stock industry to the Dominion of Canada and the large increase in exports during the last four years. Of the total of \$372,394,380 of agricultural produce exported in the fiscal year ended March 31, 1916, animal produce contributed \$105,919,190.

Survey and census of cattle in Bengal: A review (*Agr. Jour. India*, 12 (1917), No. 4, pp. 593-598).—A discussion of the kinds and characteristics of the cattle of the various districts of Bengal. The total number of cattle is given as 25,355,888 head, of which number 944,633 are buffaloes.

Louisiana lespedeza hay v. western timothy hay, W. H. DALRYMPLE (*Baton Rouge, La.: H. D. Wilson*, [1917], pp. 7).—By a comparison of chemical analyses and coefficients of digestibility of lespedeza hay and timothy hay values are drawn of the two forages. Planters are urged to produce, sell, and use the home-grown lespedeza hay instead of the more expensive western timothy hay.

The value of cider apples and pomace as foods for farm stock, B. T. P. BARKER and B. N. WALE (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta.*, 1916, pp. 78-80).—A preliminary account is given of feeding apple pomace to pigs. The results indicate that for pigs of from 55 to 60 lbs. neither cider apples nor pomace gave as satisfactory increase when fed with meals as did the meals alone. For older pigs the results were more favorable.

Two analyses of apple pomace are given.

The use of the horse chestnut as a feed for animals, DECHAMBRE (*Compt. Rend. Acad. Agr. France*, 3 (1917), No. 32, pp. 926-940).—A compilation of work done with the horse chestnut in determining its feeding value and methods of preparation to make it palatable. Tables of analyses and coefficients of digestibility are incorporated.

Cause and prevention of rancidity in palm nut kernel cake, R. B. CALDER (*Jour. Agr. Sci. [England]*, 7 (1916), No. 4, pp. 470-472).—The experiments reported show that the rancidity of palm nut kernel cake is due to the action of a lipase set free from a zymogen present in the seed under the influence of warmth and moisture. If the cake is heated the zymogen is usually destroyed. If the cake is kept dry and cool it remains sweet. If kept moist and warm it becomes rancid in a few days from the action of the lipase which splits the fats or oils, forming rancid fatty acids. The lipase can be destroyed by heating the moistened cake to 70° C. for a short time.

Modern ensilage practice, A. W. OLDERSHAW (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 29 (1917), pp. 68-86, figs. 3).—A discussion of the feasibility of the silo in farm practice in England and Scotland. A history of the efforts to make silage in Great Britain is detailed, with suggestions as to types of silos and kinds of forage available. At the present time there are 40 silos in East Anglia with indications that this number will be increased.

Making and feeding silage, E. W. SHEETS (*W. Va. Univ. Agr. Ext. Dept. Circ.* 154 (1917), pp. 16, figs. 3).—The making of silage is described and the feeding to different classes of live stock is discussed and rations suggested.

Roughages and roots, G. E. BROWN (*Breeders' Gaz.*, 73 (1918), No. 6, p. 259).—A method of conserving feed in Montana is described. Large barns simply covered are built and the alfalfa when cut is put in with layers of straw. The juices of the fresh alfalfa are absorbed by the straw and the whole keeps well. When fed the mixture is passed through a machine and finely cut, and is readily consumed without waste.

The author describes a method he himself followed with much success, especially in fitting horses for exhibition. Steamed mangels were put into a box while hot and mixed with cut hay, oats, and bran. The box was covered and left to steam over night, the mixture being still warm the next morning.

Feed stuff analyses (*Id. Agr. Col. Quart.*, Nos. 72 (1916), pp. 15; 76 (1917), pp. 15).—A list of feeds and analyses of samples obtained from January to May, 1916, and from June, 1916, to May, 1917, inclusive, are given. The

materials were, as a rule, proprietary by-products from the manufacture of oils, alcohol, whisky, beer, breakfast foods, etc., or mixtures of them with refuse molasses, but also included meat meal and tankage, brewers' and distillers' grains, cottonseed meal, linseed meal, dried beef pulp, alfalfa meal, gluten feed, and corn oil meal. The examination of wheat bran, middlings, corn meal, and similar feeds was limited in most cases to a microscopical test for adulterants.

Commercial feeding stuffs and registrations for 1917, C. S. CATHCART ET AL. (*New Jersey Stat. Bul. 311 (1917)*, pp. 5-100).—Results are given of the inspection of feeding stuffs in the State during the year 1917, including tabulated analyses of the following feeding stuffs: Alfalfa meal, blood meal, brewers' dried grains, buckwheat middlings, buckwheat offal, coconut meal, cottonseed feed, cottonseed meal, corn bran, corn feed meal, gluten feed, gluten meal, corn oil cake meal, corn and cob meal, distillers' dried grains, dried beet pulp, feeding flour, fish scrap, hominy meal and feed, linseed meal, malt sprouts, meat scrap, oat hulls, peanut meal, rye bran, rye middlings, shredded wheat waste, vegetable tankage, wheat bran, wheat middlings, and mixed and proprietary feeds. Of the 1,103 samples examined 10 per cent were deficient in protein and 9.3 per cent in fat. A list of manufacturers who registered feeding stuffs for sale in 1917 is appended.

Feeding stuffs report, 1916, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 295 (1917)*, pp. 269).—During the year samples collected for inspection totaled 1,148, while 263 special samples were sent in for analysis. The number of deficiencies increased somewhat over 1915, especially with cottonseed meals. The poultry feeds showed improvement with a smaller incorporation of weed seeds. Several of the proprietary feeds carrying molasses were found to be moldy. The gross adulterations were few in number.

Analytical results and microscopical examinations reported covered the following: Oil-cake meals, distillery and brewery by-products, maize by-products, wheat offals, rye offals, wheat and rye offals, oat by-products, buckwheat offals, alfalfa meal, dried beet pulp, proprietary and miscellaneous mixed feeds, animal by-products, and condimental stock and poultry feeds.

Feeding stuffs report, G. G. HUTCHISON (*Penn. Dept. Agr. Bul. 290 (1917)*, pp. 80-100).—A report on the feeding stuffs trade and control read at the fortieth annual meeting of the Pennsylvania State Board of Agriculture at Harrisburg, Pa., January 23 and 24, 1917.

Basal katabolism of cattle and other species, H. P. ARMSBY, J. A. FRIES, and W. W. BRAMAN (*Jour. Agr. Research [U. S.], 13 (1918)*, No. 1, pp. 43-57, figs. 8).—The work here reported is a part of cooperative investigations between the Bureau of Animal Industry of the U. S. Department of Agriculture and the Institute of Animal Nutrition of the Pennsylvania State College. The authors state that the term "basal katabolism" is generally accepted as a convenient designation for that portion of the katabolism due to the fundamental vital processes as distinguished, on the one hand, from that arising from external muscular activities and, on the other hand, from that caused by the ingestion of food. It is the katabolism of the animal in a state of complete muscular rest and with the processes of digestion and resorption suspended.

Results are given of 27 determinations of the daily basal katabolism of unfattened cattle of different weights and ages. These results are compared with those secured by other workers with man, cattle, swine, and horses.

The basal katabolism, whether computed lying or standing or for an equal proportion of each, was found to be equally well correlated with the estimated

body surface and with the live weight. The basal katabolism per unit of body surface showed considerable variability and a positive correlation with the live weight. The mean computed 24-hours basal katabolism per square meter of body surface was 964 ± 24 calories for cattle lying, $1,173 \pm 21.4$ calories for cattle standing 12 hours and lying 12 hours, and $1,365 \pm 25.7$ calories for cattle standing 24 hours.

"The mean daily basal katabolism per square meter of body surface appears not to differ greatly in man, cattle, swine, and horse under comparable conditions."

A list of the literature cited is appended.

The mathematical valuation of feeds in animal production, T. PFEIFFER (*Landw. Vers. Stat.*, 87 (1915), No. 6, pp. 409-447, figs. 3).—The author shows by a comparison of estimated values of feeds with those from the results of experiment that the former are not complete or mathematically correct or absolute, but are subject to changes and corrections. The calculation of food values may be ultimately nearer exactness, but it will always be subject to corrections. There are not enough data at present upon which to base changes in tables of values, but they can only be considered at this time as guides that are not always borne out in practice. Only by further research can we perfect the tables of food values that we now have and find means of unifying and stabilizing them.

The calculation of the values of the components of feeds, A. STIELTJES (*Indus. Lait. [Paris]*, 42 (1917), No. 9, pp. 117-119).—In comparison with the method of the calculation of food values as given by Kellner there is shown one advocated in France and England. In this method the protein and fat combined are multiplied by 2.5 and added to the carbohydrate.

Suggestions on feeding stock, G. E. DAX (*Ontario Dept. Agr. Bul.* 246 (1917), pp. 3-20).—Despite the high prices of feeds, farmers are advised to continue stock feeding for reasons given, showing this to be the better practice even during the present emergency. A description and valuation of various available feeds are given.

The utilization of fatty acids for feeding purposes, A. LAUDER and T. W. FAGAN (*Jour. Soc. Chem. Indus.*, 36 (1917), No. 20, pp. 1069-1071).—The manufacture of glycerin for explosives during the last three years has left as a by-product large amounts of fatty acids. For the utilization of this material feeding to live stock has been suggested.

To determine the value of fatty acids as a feed, those from coconut oil were selected for trial. Two lots of five pigs each were fed equal parts of corn meal and middlings and green feed. In the grain ration of the second lot about 5 per cent was replaced by the fatty acids. The experiment was continued for four weeks. The pigs in the second lot ate the mixture readily and apparently made as satisfactory gains as those in the first lot.

In another and more accurate experiment 10 newly weaned pigs averaging 27.5 lbs. each were divided into two lots and fed from May 7 to July 19. Lot 1 received in the beginning 6.25 lbs. of the meals daily, which was gradually increased to 12 lbs. at the close of the experiment, and lot 2 received 5.25 lbs. of the meals daily, increased gradually to 10 lbs. at the close of the experiment. In addition lot 2 received 5 oz. of fatty acids in the beginning, which was increased gradually to 9.5 oz. at the close of the experiment. Lot 1 made a total gain of 145.5 lbs. and lot 2, 143 lbs.

As the amount of the rations was kept low while the gains were nearly equal, it would appear that the fatty acids were assimilated.

[Feeding and grazing experiments with pigs and cows], F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1916, pp. 13-17*).—In a cooperative experiment under farm conditions 34 pigs gained 950 lbs. live weight in 21 days on 1.25 acres of a mixture of field peas and wheat. With pork at 7 cts. per pound, the value of the gain was \$53.20 per acre. No additional feed was given during the grazing period.

Sufficient feed for 2 cows from April 28 to August 15, and a third cow from June 15 to August 1, was furnished by 1.25 acres of sweet clover. No bloating occurred, but the cows did not stay in the best of condition. Pigs failed to make satisfactory gains on sweet clover pasture, although they seemed to eat the sweet clover readily.

One plat of 0.25 acre of alfalfa furnished grazing for 10 9-week-old pigs from May 13 to the latter part of August. On September 9, 4 of the pigs were removed and the 6 remaining pigs were grazed for 14 days longer. A 2 per cent ration of barley was fed throughout the experiment. There was a total gain of 2,788 lbs. per acre during the 152 days, 2.37 lbs. of barley being fed per pound of gain. Valuing pork at 7 cts. and barley at 1.5 cts. per pound, there was a net return of \$96.16 per acre. Another plat of 0.53 acre of alfalfa of inferior growth, supplemented with a 2 per cent ration of barley, produced 1,821 lbs. of pork from May 13 to September 23, 1916. In this test the pigs ate 2.86 lbs. of barley per pound of gain and returned \$63.10 per acre for the alfalfa. At the close of the alfalfa pasture experiments some of the pigs were placed in dry lot and fed alfalfa hay and barley. A 3 per cent ration of barley was fed from September 30 to October 24, a 3.5 per cent ration of barley from October 24 to November 16, and an unlimited supply of barley from November 16 to December 2, when they were sold. During the 63 days the pigs increased in weight from 1,117 to 1,805 lbs. Although the percentage of daily gain was materially increased by feeding an unlimited ration, the amount of barley required to produce a pound of gain was unchanged, the average for the entire period being 4.6 lbs. In this test the cost of the barley at 1.5 cts. per pound was practically equal to the value of the gain at 7 cts. per pound.

Rice hulls as a feed for work cattle, A. PIRROCHI (*Ann. Ist. Agr. [Milan], 19 (1915-16), pp. 107-121*).—Favorable results are reported in feeding rice hulls with hay to cattle.

Silages for fattening steers, H. K. GAYLE and E. R. LLOYD (*Mississippi Sta. Bul. 182 (1917), pp. 15, fig. 1*).—Results are given of feeding experiments with steers during two winters for the purpose of comparing silages made from (1) Goliad corn, (2) Early Amber sorghum, (3) equal parts of cowpeas and Johnson grass, (4) corn stover, (5) Texas Seeded ribbon cane, (6) equal parts of Goliad corn and Early Amber sorghum, and (7) equal parts of Goliad corn and Mammoth Yellow soy beans. As a basis for comparing the silages with a dry roughage, cottonseed hulls were fed to one lot of steers. On lands of equal fertility these silage crops varied in yield from 3.6 tons for cowpeas to 15.25 tons for Texas Seeded ribbon cane. The cost per ton of crops put into the silo varied from \$1.26 for Texas Seeded ribbon cane to \$2.93 for cowpeas.

The steers in lots 1 to 5, inclusive, used the first winter averaged about 900 lbs. each; and those in lots 6 to 9, inclusive, used the second winter averaged about 750 lbs. each. They were fed in an open shed. Lots 1 to 5, received cottonseed meal as a sole concentrate; and lots 6 to 9, cottonseed meal and corn and cob meal (2:1) for the first two weeks and cottonseed meal thereafter. During the first winter the steers were fed 137 days, the average daily ration per steer being 6.5 lbs. of cottonseed meal and in addition 45.32 lbs. of silage for

lots 1 to 4, and 27.15 lbs. of cottonseed hulls for lot 5. The average daily gains per head were 1.73 lbs. for lot 1; 1.58 lbs. for lot 2; 1.31 lbs. for lot 3; 0.65 lb. for lot 4; and 1.58 lbs. for lot 5. The steers were fed 92 days during the second winter, the average daily ration, after the corn and cob meal period, being 5 lbs. of cottonseed meal and about 40 lbs. of silage. The average daily gains per steer were 1.52 lbs. for lot 6; 1.36 lbs. for lot 7; 1.72 lbs. for lot 8; and 1.88 lbs. for lot 9. Based on the roughage required per pound of gain, it is noted that when the steers were fed 137 days, 1 lb. of Goliad corn silage was equivalent to 1.124 lbs. of Early Amber sorghum silage; 1.355 lbs. of cowpea and Johnson grass silage; 2.732 lbs. of corn stover silage or 0.663 lb. of cottonseed hulls. When the steers were fed 92 days, 1 lb. of Goliad corn silage was equivalent to 1.134 lbs. of Texas Seeded ribbon cane; 0.903 lb. of equal parts of a mixture of Goliad corn and Early Amber sorghum silage, or 0.833 lb. of equal parts of a mixture of Goliad corn and Mammoth Yellow soy bean silage. The costs per pound of gain varied from 8.37 cts. for lot 8 to 28.84 cts. for lot 4.

In the second part of the bulletin the nutrients furnished by each ration are correlated with the gains made by the steers on the various rations. Tabulated data show the results of the chemical analyses of the feeds and the nutrients consumed per pound of gain. Using Kellner's estimate of a maintenance ration and the coefficients of digestibility drawn from Henry and Morrison's tables, the authors construct a table which shows the total digestible nutrients required for each lot for maintenance for the time fed, and the digestible nutrients required per pound of gain from each ration over and above that required for maintenance.

Baby beef and calf feeding, H. K. GAYLE (*Mississippi Sta. Bul.* 183 (1917), pp. 3-35, figs. 3).—Previously noted from another source (*E. S. R.*, 39, p. 169).

Raising calves with modified skim milk, R. GIULIANI (*Ann. Ist. Agr. [Milan]*, 13 (1915-16), pp. 123-146, figs. 4).—The author reports the successful substitution of skim milk for whole milk in calf feeding by incorporating in the former oleomargarin and starch with levulose. The young calf is gradually changed from whole milk to the substitute. The physiological effects are said to be good, while more economical results are obtained.

Breeding experiments with Welsh mountain ewes for the production of fat lambs (*Univ. Col. N. Wales, Bangor, Dept. Agr. [Pubs.]* 4 (1914), pp. 8; 4 (1915), pp. 3-5).—The results are given of breeding mountain grade ewes in lots of 25 each in Southdown, Hampshire, Romney Marsh, and Wensleydale rams.

In two years' work the Southdown cross lambs averaged 8 lbs. less in weight when sold. They are, however, held in higher esteem by the butchers and readily become fat at any age under most lowland conditions. To give equal returns with the others it is necessary that they bring 0.5d (1 ct.) a pound more, live weight. In many local markets they do this. The Hampshire cross came next to the Southdown. The Romney Marsh and Wensleydale crosses were not desirable for early fat lambs, though for fattening the following winter they could be recommended.

During 1913-14 and 1914-15 similar experiments were carried out using Southdown, Wiltshire, Ryeland, and Border Leicester rams. From the two years' results the greatest weights were made by the Border Leicester cross, and they also matured early. Another advantage was a heavy fleece, which is desirable if the lambs are carried over. The proportion of carcass weight to live weight was again very favorable to the Southdown cross. For markets, how-

ever, that do not appreciate the quality of the Southdown to the extent of paying a higher price, the Leicester cross may be recommended.

Feeding lambs for the block, E. S. ARCHIBALD (*Canada Expt. Farms Pamphlet 16* [1917], pp. 4).—Attention is called to the favorable outlook in lamb feeding at the present time. While the proper time to sell lambs is when they are finished, they should be selected out and uniform lots sold, the lighter ones being held for further feeding. Again, most Canadian lambs are sold in the fall but a better distribution would tend to maintain prices.

From a summary of the work of the experimental farms of the Dominion the profits from the winter finishing of lambs are estimated to have ranged from 25 cts. to \$3.52 per head. Suggestions are made as follows: All of the best ewe lambs and selected pure-bred ram lambs should be kept for breeding. Grass is the ideal ration for sheep. Alfalfa is placed first of the dry roughages, followed by clover hays and mixed hays. Of the succulent roughages corn silage, when costing not over \$2 per ton, is the cheapest and best for lambs. Turnips are safer than mangels. A mixture of grain feeds is best. Mill feeds can often be profitably used as a part of the ration, but those finely ground and of a pasty nature should be avoided.

While local supplies and prices should govern, it is suggested that generally it will not pay to exceed 1.25 lbs. of grain per lamb at the finish or 5 lbs. of succulent roughage and from 3 to 5 lbs. of dry roughage.

Mating sows before their litters are weaned. Late spring and early fall farrowing possible, W. L. ROBISON (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 5, pp. 142, 143).—Results are given on the four seasons' experience in reference to the possibility of breeding sows prior to the time the pigs are weaned and while the pigs are comparatively young. The method followed is to separate the sows and pigs each night. Usually after the sows have been kept away from their pigs over night for four or five successive times oestrus occurs. In some instances a longer time was necessary, but in only one case did the plan fail. The indications are that sows will come in heat almost or quite as readily under this treatment as when their pigs are entirely weaned before the sows are bred.

The advantages of breeding during lactation are pointed out.

The feeding and management of swine, J. M. HUNTER (*New Jersey Stas. Circ. 90* (1917), pp. 43, figs. 16).—This is a treatise on the feeding, care, and management of swine under New Jersey conditions.

The swine industry in Colorado, W. T. WASEL and G. E. MORTON (*Denver: Colo. Bd. Immigration*, [1917], pp. 11-13).—Conditions for increased hog production in Colorado are noted. A greater employment of hogs on the farms for utilizing waste products and adding to income is urged.

Substitutes for oats in feeding horses, R. GIULIANI (*Gior. Med. Vet.*, 66 (1917), No. 12, pp. 265-278).—A résumé of work in various countries in lessening the cost of maintenance in keeping horses. The feeding value of oats and the local price is compared with that of other available feeds.

What steps should be taken in England and Wales to secure an adequate supply of horses suitable for military purposes? (*Bd. Agr. and Fisheries [London], Rpt. Com. Supply Horses Mil. Purposes*, 1915, pp. 26).—The committee recommended, among other things, the compulsory registration annually of all stallions used, an increase in premiums offered for stallions, the placing by the Government of selected mares in the hands of selected breeders, the purchase by the Government of stallions for country service, the award of prizes for brood mares and foals, an annual census of horses, together with those

imported and exported, and the services of an advisory council, county committees, and an expert staff of supervisors.

Feeding experiments with laying hens, W. J. Buss (*Ohio Sta. Bul. 322 (1918), pp. 199-241, figs. 4*).—Experiments reported upon range *v.* confinement, variety *v.* simple rations, and various amounts of protein in rations are in continuation of those already noted (*E. S. R.*, 35, p. 171), while the experiments upon different methods of feeding, egg production of early, medium, and late hatched pullets, and a comparison of corn and wheat for hens represent new lines of work.

The following table summarizes the results of four experiments conducted to compare the egg production of hens kept in close confinement with that of hens allowed free range:

Range v. confinement for laying hens.

Experiment.	Condition.	Duration.	Average number in lot.	Mortality.	Gain or loss (—) in weight per hen.	Cost of feed per hen.	Eggs per hen.	Cost of feed per dozen eggs.	Value of eggs less cost of feed per hen.
		<i>Days.</i>		<i>Per ct.</i>	<i>Pounds.</i>			<i>Cents.</i>	
1b.....	Confined (1915-16).....	364	39.82	18.2	0.14	\$1.34	100.2	16.0	\$1.09
1b.....	On range (1915-16).....	364	43.51	22.0	.06	1.37	115.7	14.2	1.47
1b.....	Confined (1916-17).....	364	43.76	18.4	— .09	1.31	91.3	17.2	0.88
1b.....	On range (1916-17).....	364	43.17	26.0	.01	1.32	101.5	15.6	1.13
1c.....	Confined.....	336	72.88	17.7	— .04	1.13	72.6	18.7	0.61
1c.....	On range.....	336	72.50	34.2	.05	1.10	111.5	11.9	1.57

The earlier experiment on the necessity for a large variety of feeds for laying hens was continued, and one lot was added to test the relative efficiency of meat scrap and feeding tankage as sources of protein for laying hens. All the lots were fed shelled corn, and in addition lot 1 was fed a mash of ground corn and meat scrap (8:5); lot 2, a mash of ground corn, bran, and meat scrap (7:3:5); lot 3, wheat and oats (2:1) and a mash of ground corn, bran, middlings, linseed meal, and meat scrap (4:4:4:1:3); and lot 4, a mash of ground corn, bran, and tankage (7:3:4). The experiment lasted 728 days. Some of the results are summarized in the following table:

Variety and simple rations for laying hens.

Lot.	Average number in lot.	Mortality.	Gain in weight per hen.	Grain and mash consumed per hen.	Eggs produced per hen.	Feed consumed per dozen eggs.	Value of eggs less cost of feed per hen.
		<i>Per cent.</i>	<i>Pound.</i>	<i>Pounds.</i>		<i>Pounds.</i>	
1.....	28.13	10.0	0.17	119.15	241.3	5.92	\$3.23
2.....	27.10	23.3	.04	118.67	242.6	5.87	3.32
3.....	25.80	23.3	.09	131.49	261.3	6.04	3.47
4.....	27.98	13.3	.11	117.88	240.9	5.87	3.40

Rations containing approximately 10, 15, and 20 per cent of crude protein were further compared as food for laying hens, the test being carried on for 308 days with White Leghorn hens, 224 days with Barred Plymouth Rock hens, and 364 days with White Leghorn pullets. As in the previous year, the rations were made up of shelled corn and wheat (3:1) and a mash of ground corn, bran, and meat scrap, in the following proportions: Lot 1, 11:3:1; lot 2,

6:3:6; and lot 3, 1:3:11. Some of the results are given in the following table:

Rations of different protein content for laying hens.

Lot.	Protein content of ration.	Breed.	Average number in lot.	Mortality.	Gain or loss (-) in weight per hen.	Grain and mash consumed per hen.	Eggs produced per hen.	Feed consumed per dozen eggs.	Value of eggs less cost of feed per hen.
				<i>Per cent.</i>	<i>Pound.</i>	<i>Pounds.</i>		<i>Pounds.</i>	
1	10	Barred Plymouth Rocks.....	33.62	23.6	0.22	47.89	61.4	9.35	\$0.45
2	15	do.....	37.17	27.9	.32	49.16	63.6	9.27	.35
3	20	do.....	37.36	10.3	-.18	44.51	48.5	11.00	.....
1	10	White Leghorns.....	50.02	18.4	-.17	46.80	83.5	6.72	.95
2	15	do.....	49.81	9.6	.11	50.01	93.6	6.41	1.03
3	20	do.....	54.41	5.4	-.01	46.71	77.1	7.27	.63
1	10	White Leghorn pullets.....	53.58	6.7	.32	58.19	93.6	7.46	1.09
2	15	do.....	53.15	15.0	.28	64.40	139.6	5.54	2.01
3	20	do.....	55.65	16.7	.06	63.56	128.5	5.94	1.58

In testing methods of feeding an experiment was run for 728 days from December 16, 1915, using six lots of 30 White Leghorn pullets each. Lots 1, 2, and 3 were fed a grain mixture of corn, wheat, and oats (3:2:1) and a mash of ground corn, bran, middlings, linseed meal, and meat scrap (4:4:4:1:3); lot 4, no grain and the above mash; lot 5, the above grain mixture and meat scrap; and lot 6, a different ration each four weeks, made up of the above feeds. Lots 1 and 6 were fed the grain in litter and the mash dry in hopper; lot 2, grain in trough and mash dry in hopper; lot 3, grain in litter and mash moist once daily in trough; lot 4, mash dry in hopper; and lot 5, grain in litter and meat scrap once daily in trough. The following table summarizes the results:

Effect of different methods of feeding pullets.

Lot.	Average number in lot.	Mortality.	Gain or loss (-) in weight per hen.	Grain and mash consumed per hen.	Eggs produced per hen.	Feed consumed per dozen eggs.	Value of eggs less cost of feed per hen.
		<i>Per cent.</i>	<i>Pound.</i>	<i>Pounds.</i>		<i>Pounds.</i>	
1.....	28.77	16.7	0.03	130.06	250.6	6.23	\$3.24
2.....	28.70	3.3	.12	125.02	249.6	6.01	3.28
3.....	30.00	.....	-.05	127.27	256.2	5.96	3.41
4.....	27.86	20.0	.05	122.89	246.8	5.97	3.43
5.....	27.24	28.7	.28	116.62	228.9	6.12	2.77
6.....	26.78	16.7	.16	122.67	255.2	5.77	3.54

In the experiment to test the effects of different dates of hatching upon the number, value, and feed cost of eggs produced by White Leghorn pullets, each lot of pullets was placed on test when egg production began and taken off when egg production ceased after the first year's production. The pullets in lot 1 were hatched February 22 and began laying August 10, those in lot 2 were hatched April 20 and began laying November 2, while those in lot 3 were hatched June 13 and began laying December 28. The rations consisted of shelled corn and wheat (3:1) and a mash of ground corn, bran, and meat scrap (2:1:2). Some of the results are summarized in the table following.

Egg production of pullets hatched at different dates.

Lot.	Duration.	Average number in lot.	Mortality.	Gain or loss (—) in weight per pullet.	Grain and mash consumed per pullet.	Eggs produced per pullet.	Feed consumed per dozen eggs.	Value of eggs less cost of feed per pullet.
	<i>Days.</i>		<i>Per ct.</i>	<i>Pound.</i>	<i>Pounds.</i>		<i>Pounds.</i>	
1.....	448	29.01	6.7	0.04	83.55	166.9	6.01	\$2.22
2.....	392	28.36	10.0	.15	75.69	156.4	5.81	2.16
3.....	336	29.50	3.3	— .08	60.61	144.0	5.05	2.11

In order to see if wheat can be replaced by corn in rations for laying hens, an experiment was conducted with two lots of 50 White Leghorn pullets each for 364 days beginning October 31, 1915. These pullets were fed a mash of ground corn, bran, meat scrap, and linseed meal (4:2:2:1), and in addition lot 1 was fed shelled corn and lot 2 wheat. The mortality in lot 1 was 8 per cent and in lot 2, 52 per cent. Lot 1 produced an average of 89.5 eggs per pullet and consumed 7.7 lbs. of feed per dozen eggs, while lot 2 laid an average of 95.7 eggs each and consumed 7.26 lbs. of feed per dozen eggs. The value of eggs over cost of feed per pullet was \$1 for lot 1 and 69 cts. for lot 2. In another test comparing wheat and corn, four lots of 50 White Leghorn pullets each were fed for 364 days from November 26, 1916. The grain ration consisted of shelled corn for lot 1, shelled corn and wheat 2:1 for lot 2 and 1:2 for lot 3, and wheat for lot 4. The mash was made up of bran, meat scrap, and linseed meal (2:2:1), and in addition 4 parts of ground corn for lot 1, 4 parts of ground wheat for lot 4, and 4 parts of a mixture of ground corn and ground wheat 2:1 for lot 2 and 1:2 for lot 3. Beginning May 13, 1917, lot 4 was fed the same ration as lot 1. The following table gives the results obtained during the two periods November 26, 1916, to May 12, 1917, and May 13 to November 24, 1917:

Corn v. wheat for laying pullets.

Lot.	Period.	Average number in lot.	Mortality.	Gain or loss (—) in weight per pullet.	Grain and mash consumed per pullet.	Eggs produced per pullet.	Feed consumed per dozen eggs.	Value of eggs less cost of feed per pullet.
	<i>Days.</i>		<i>Per cent.</i>	<i>Pound.</i>	<i>Pounds.</i>		<i>Pounds.</i>	
1.....	168	50.00	—	0.04	26.65	56.9	5.62	\$0.91
2.....	168	49.80	2.0	.12	27.91	57.1	5.87	.77
3.....	168	49.96	2.0	.20	27.67	57.7	5.75	.81
4.....	168	44.33	42.0	.16	25.59	35.9	8.56	.23
1.....	196	49.54	4.0	.34	27.53	41.4	7.97	.45
2.....	196	48.46	4.1	.22	27.52	32.5	10.16	.13
3.....	196	47.02	14.3	— .02	25.45	28.6	10.67	.03
4.....	196	28.03	3.4	.50	26.09	32.0	9.77	.25

Data secured with a flock of 200 White Leghorn hens at the Clermont County experiment farm are appended. These hens were housed in a single building and had access to practically unlimited range. From October 28, 1915, to October 25, 1916, they laid an average of 133.4 eggs per hen, the value of which, less the cost of feed, was \$2. From October 26, 1916, to October 5, 1917, the hens laid an average of 103.5 eggs each, the value of which, less cost of feed, was \$1.17.

A wheatless ration for the rapid increase of flesh on young chickens, MARY E. PENNINGTON, H. A. McALEER, A. D. GREENLEE, ET AL. (*U. S. Dept.*

Agr. Bul. 657 (1918), pp. 12, pl. 1).—A comparison is reported of the three following rations for the coop feeding of young chickens for market by commercial feeders: (A) Corn meal 100 lbs. and water 127 lbs., (B) corn meal 100 lbs. and buttermilk 150 lbs., and (C) corn meal 75 lbs., dried distillers' grains 25 lbs., and buttermilk 150 lbs. The chickens used in the tests were of the class known as broilers and varied in weight from 0.75 lb. to 2.5 lbs., with an average of 1.7 lbs. Each lot consisted of 100 chickens, and all the birds were fed for 14 days. Some of the results obtained are summarized in the following table:

Rations for commercial or coop fleshing of young chickens.

Ration.	Weight per 100 birds.		Increase in live weight.	Birds making gains in live weight.	Feed consumed, including water.		Total shrinkage in killing, dressing, and chilling.	Edible portion of chilled weight.
	Initial.	Final.			Per 100 birds.	Per pound of gain.		
	Pounds.	Pounds.	Per cent.	Per cent.	Pounds.	Pounds.	Per cent.	Per cent.
A.....	172.1	180.7	5.00	79.03	377.7	43.91	10.46	53.8
B.....	169.7	221.3	30.41	95.97	457.9	8.88	10.67	55.2
C.....	171.1	231.0	35.01	96.75	473.6	7.91	10.92	55.1

The amount of feed required per pound of gain for ration B was 8.21 lbs. during the first 4 days of the feeding period, 8.35 lbs. during the first 8 days, and 8.49 lbs. during the first 11 days. For ration C the feed required per pound of gain during the above periods was 7.69, 7.9, and 7.76 lbs., respectively.

In these tests the best results were obtained with birds having an initial live weight of 2 lbs. or less. The economic advantage of fleshing broilers at the packing house is briefly discussed.

Analyses are given of the feeds used.

Home-grown crops for the poultry flock, V. G. AUBRY (*New Jersey Stas. Hints to Poultrymen*, 6 (1918), No. 3, pp. 4).—A brief discussion of the value and utilization of poultry manure and the home growing of poultry feeds.

A quick method of obtaining accurate individual egg records without the trap nest, B. ALDER and A. D. EGBERT (*Utah Sta. Bul. 162 (1918), pp. 3-12, figs. 8*).—In the method described the hens are confined in the house and are caught and examined shortly after daylight each morning, a record being made of those the examination indicates are to lay that day. The test is based on the fact that if a hen is to lay at any time during a given day, the egg can be easily felt early that morning by a slight pressure with the finger on the side of the abdomen just below and nearly to the end of the pelvis bone. Directions are given for catching and examining the hen.

It is stated that with trained hens, two men at the station have been able to examine and record 500 hens in 16 colony houses in 37 minutes. By this method in 1915 out of a total of 42,886 eggs only $\frac{1}{3}$ of 1 per cent were unrecorded. In comparing the method with the trap nest, one pen in April, 1916, gave an indicated production of 308 eggs by this test, whereas 307 eggs were gathered, 19 of which were laid outside the trap nest. In May, 1916, the same pen tested 259 eggs and 251 were gathered, 15 of which were laid outside the trap nest.

Telling the age of eggs, S. L. BASTIN (*Jour. Bath and West and South. Counties Soc.*, 5. ser., 11 (1916-17), p. 132, pls. 2).—A method is described and illustrated for determining the age of eggs by days up to four weeks. The egg

is placed in a brine of water and salt, 2:1. Its position in the brine and the inclination shown on a degree scale indicates the age of the egg.

How to candle eggs, MARY E. PENNINGTON, M. K. JENKINS, and H. M. P. BETTS (*U. S. Dept. Agr. Bul. 565 (1918), pp. 20, pls. 12, figs. 4*).—This bulletin illustrates two simple egg-candling devices, describes the structure of the egg, and tells how to hold an egg and what to look for in candling. The different types of eggs found in commerce are classified according to edibility and possibility of detection by candling, and a brief description of the appearance of each type of egg before the candle and out of the shell is given. These descriptions are tabulated, and plates, for the most part colored, illustrate the principal distinguishing characteristics.

The poultryman's guide, 1915, compiled by T. E. QUISENBERRY (*Ann. Rpt. Poultry Bd. [Missouri], 1915, pp. 45-250, figs. 36*).—This contains the annual report of the State Poultry Board and a number of practical articles on the poultry industry written by members in various sections of the State of Missouri.

The poultryman's guide, 1916, compiled by C. T. PATTERSON (*Ann. Rpt. Poultry Bd. [Missouri], 1916, pp. 97, figs. 31*).—A guide similar to the above.

A good living from poultry for disabled soldiers and others, F. G. PAYNTER (*London: George Newnes, Ltd. [1917], pp. 39*).—This booklet deals with the subject of poultry raising under the following headings: Poultry for land settlement, egg production, stock birds, chicken rearing, and fattening.

The rearing of Angora rabbits for their wool, L. E. MOORE (*Jour. Bd. Agr. [London], 23 (1916), No. 7, pp. 664-668*).—A description of the industry as carried on in France.

DAIRY FARMING—DAIRYING.

A study of cattle "temperament" and its measurement, A. F. POTT (*Ohio Jour. Sci., 18 (1918), No. 4, pp. 129-144, figs. 8*).—The author attempts to establish a method whereby the nervous activity of cattle, or so-called "dairy temperament," may be measured. The results indicate that by means of pneumographic tracings the various nervous activities of cattle can be measured and recorded on a quantitative basis. The study was confined to the measurement of the variability of the depth of breathing shown by four Holstein cows under the same normal stable conditions. All the cows reacted similarly, differing only in degree of intensity of nervous reaction.

Conclusions as to which animal was the most nervous were drawn from the degree of intensity of the nervous reaction. The bearings of the results upon the interpretation of dairy temperament are discussed. The present study "takes no cognizance of physical characteristics or outward indications, it deals only with the actual reactivity of the animal. Physical characteristics as applied to 'dairy temperament' . . . have not been standardized, since they mean different things to different men, and what one man may call a prominent eye, another may not consider as such. It would be better then to speak of desirable physical characteristics, as dairy form, etc., alone, and not involve them with 'dairy temperament.' Instead of using this latter term, it might be better to speak of the degree of nervous activity or reactivity which an animal possesses."

Gestation and sterility in cows, H. STALFORS (*Monatsh. Prakt. Tierheilk., 27 (1916), No. 7-8, pp. 338-358; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 12, pp. 1799, 1800*).—In gestation studies from 1907 to 1915 a large number of in-calf cows were examined for the pur-

pose of determining in which horn of the uterus the fetus was carried. The examinations were made per rectum some time between the sixth and fifteenth week of gestation, that period being the most favorable for the operation, fluctuation, asymmetry, and an increase in size of the uterus were taken as symptoms of pregnancy.

Out of a total of 923 cows examined, 577 cows carried the fetus in the right horn of the womb, and 346 in the left horn, proportions which are approximately those found by other workers. With 105 of the cows, the animals were kept under observation for two successive periods of gestation, and in 62 of the cases the fetus was twice carried in the same horn, indicating that the one ovary was rather more productive than the other.

The influence of handling on the production of ovaries was also studied. Six herds containing from 12 to 100 cows each were kept under special observation for five years, being visited every four to eight weeks, and any barren animals were subjected to an operation on the ovaries. This consisted in an exploration per rectum and of a squeezing or crushing of corpora lutea or cysts which might have persisted in the ovaries. The uterine catarrh resulting from the operation was treated at the same time by vaginal injections. Out of 264 cows so treated more than half became normally productive again. In 146 out of 211 cases of pregnancy after treatment it was possible to trace the fertilized ovum to the ovary which had been treated. A number of these pregnant cows were maintained under observation, and out of a total of 133, 81 proved to have become absolutely normal again, including a case of uterine catarrh independent of the ovaries. Of these normal pregnant cows, in 63 out of 77 cases the fertilized ovum was traced to the treated ovary.

The influence of the stage of gestation on the composition and properties of milk, L. S. PALMER and C. H. ECKLES (*Jour. Dairy Sci.*, 1 (1917), No. 3, pp. 185-198).—The authors report data obtained in studies already noted (E. S. R., 37, p. 172) bearing on this question, and in addition studies on the influence which gestation exerts upon the composition of human milk.

In the study of the influence of gestation on cow's milk complete analyses were made of the milk and milk fat throughout the entire lactation period of 10 cows which became pregnant at various stages of their lactation period and of one cow which was farrow, and the complete analyses of the milk of 3 of the 10 cows throughout a subsequent lactation when they were kept farrow. The results of these analyses, which are tabulated, indicate that a close relation exists between a change in the percentage composition of the milk and the stage of the lactation period. No change in the composition of the milk due to the stage of gestation was noted.

In studying the composition of the milk fat it was found that the relation between changes in the milk fat and the stage of lactation is less constant. The same result holds true with respect to the relation of the composition of the milk fat to the stage of gestation. In comparing the composition on corresponding days of two lactation periods of each of three cows, during one period of which the cows were pregnant and the other farrow, it was found that the same shrinkage in milk flow and the same changes in the composition of the milk occurred at the end of the farrow lactation as took place at the end of the pregnant period, but at a somewhat later stage. It is concluded that gestation does not exert any direct effect upon the composition and properties of cow's milk, but that gestation may affect the composition indirectly by hastening the close of lactation, which is the important factor involved in the changes in the composition of milk as lactation advances.

Investigations of others relative to the effect of gestation on the composition of human milk are reviewed, and data are presented on this question, as

shown by analyses of 12-hour composite samples of milk of two negro women, the samples being taken in each case from the same breast at weekly intervals during portions of periods of lactation and gestation which overlapped. The results indicate that under normal conditions pregnancy exerts no influence on the composition of human milk, but that it may greatly hasten the close of lactation, with the changes in the composition of milk which accompany it, if lactation is sufficiently advanced when the period of gestation begins. Disturbances in the health of the child being nursed by a pregnant mother were not observed in the two cases reported.

The effect of green alfalfa on milk and its products, L. F. ROSENGREN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 146 (1917), pp. 9, figs. 2; *K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 4, pp. 273-279, figs. 2).—In the experiments here reported the cows were fed green alfalfa and cowpeas as supplements to a ration of cottonseed cake, wheat bran, molasses, and wheat straw.

It was found that when green alfalfa was fed to the extent of 30 kg. per head daily an undesirable taste and smell was introduced into the milk. This taint increased with the increase of alfalfa, and was more pronounced in the evening than in the morning milk. Milk from the cows fed cowpeas had no foreign taste. The undesirable taint did not occur in the butter nor in cheese manufactured from the milk.

Investigations on the protease of milk bacteria, SWIATOPELK-ZAWADSKI (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 32 (1916), No. 4, pp. 161-170; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 11, pp. 1689, 1690).—The following conclusions are drawn from experiments on the production of protease by milk bacteria:

Pure fresh milk contains no peptone. True lactic-acid bacteria do not dissolve casein within a period of seven days; i. e., they do not produce protease. The presence of peptone in a self-coagulated milk can only be attributed to the presence of peptonizing bacteria. The decomposition of casein and other albuminoid substances only occurs through the agency of bacteria. The rate at which the albuminoids are converted to peptones increases with the temperature up to 44° C.

Proteolytic ferments may be produced by aerobic and anaerobic bacteria, both spore-forming and nonspore-forming. In the present experiments the most active aerobic bacteria were *Bacillus pyocyaneus* (after 6 hours), *B. prodigiosus* (after 18 hours), and *B. coli communis* (after 24 hours); and among the spore-formers *B. subtilis* (after 6 hours) and *B. mesentericus vulgatus* (after 18 hours). The most active anaerobic bacterium was the spore-forming *B. paraplectum fatidum* (after 24 hours). The amount of peptone produced and the rate at which it is formed vary not only with the different species but often with different strains of the same species.

The hydrolysis of casein can take place independently of the coagulation of milk, which does not even assist the process. In the present experiment neither the amount of peptone produced nor its rate of production by aerobic bacteria was affected by the presence of other bacteria in the medium. At about 12° the activity of protease is always somewhat retarded. Sterilized milk inoculated with pure cultures of various organisms and incubated at 12° already contained peptone after 8 hours with *B. pyocyaneus* and *B. subtilis*, and after anything up to 14 days with *B. coli communis*, *B. prodigiosus*, *B. paraplectum fatidum*, and *B. mesentericus vulgatus*; or, in other words, the presence of *B. acidilactici* in the unsterilized milk had no appreciable effect on the results.

Milk.—The indispensable food for children, DOROTHY R. MENDENHALL (*U. S. Dept. Labor, Children's Bur. Pub. 35 (1918), pp. 32*).—This publication includes a discussion of the milk situation, but deals mainly with the question of the value of milk as food for the child. Cow's milk is advocated for the feeding of infants who can not be breast fed. The value of milk powders and condensed and evaporated milk is also discussed.

A list of references is appended.

The daily per capita consumption of milk, H. F. JUDKINS (*Jour. Dairy Sci., 1 (1917), No. 3, pp. 246-249*).—A survey was made of the consumption of milk during three months in winter by 27 families in Storrs, Conn. Ten families with one or more children under 3 years consumed an average of 1.42 pints per head daily, in 6 families with children from 3 to 12 years the per capita consumption was 0.75 pint, and in 11 families with no children, 0.895 pint. The average for the 27 families was 1.07 pints per head daily. During the same time there was an average of 1.3 pints of milk consumed per head daily on the farms supplying milk to Storrs.

Marketing milk and cream in Florida, C. L. WILLOUGHBY (*Bien. Rpt. Dept. Agr. Fla., 14 (1915-16), pt. 2, pp. 131-136*).—The author shows the relative profits secured from selling milk, cream, butter, and ice cream at various prices, and offers suggestions as to handling and shipping these products under Florida conditions.

[Delivery of milk in Chicago], W. O. NANCE ET AL. (*Chicago: Com. Health, City Council, 1917, pp. 15*).—Suggestions are given for a cooperative system for the distribution and delivery of milk in Chicago.

Two model dairies in Habana (*Rev. Agr., Com. y Trab. [Cuba], 1 (1918), No. 1, pp. 20-26, figs. 11*).—Descriptions are given of two dairies in the vicinity of Habana in which milk is produced under sanitary conditions, and a plea is made for the improvement of the dairy industry of the island. An article by R. Gómez on Holstein cattle in Cuba is included, in which the value of this breed of cattle for improving native Cuban cattle by crossing is pointed out.

A survey of the Madras dairy trade, A. CARRUTH (*Dept. Agr. Madras Bul. 73 (1917), pp. 46, figs. 10*).—A general outline is given of conditions surrounding the milk supply of the city of Madras, special attention being paid to the sanitary and economic phases, and suggestions for improvement.

Method of preserving butter, T. PAUL (*Chem. Ztg., 41 (1917), pp. 74, 75; abs. in Jour. Soc. Chem. Indus., 36 (1917), No. 10, p. 561*).—In the method here described butter is melted at from 40 to 45° C., and the fat separated. While still warm 30 gm. of salt which has been strongly heated and then cooled to about 45° is added to each pound of fat. The vessel is allowed to stand for two or three hours in a warm place so that the fat remains fluid, and the mixture is meanwhile frequently stirred. It is then filtered through cotton wool in a hot-water funnel, and the filtered fat is placed in bottles, filled almost to the stopper, and kept in a cool, dark place. To reproduce the butter the fat is melted at about 40°, and 85 parts by weight is vigorously shaken with 15 parts of fresh milk for two or three minutes and the emulsion is rapidly cooled by ice water. Milk fat thus preserved is said to keep for at least a year.

Experiments on the manufacture of cheese from pasteurized milk, E. HAGLUND (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 140 (1917), pp. 22; K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 1, pp. 43-62*).—Results are given of experiments on the effect of pasteurization of milk by the holding method upon the curdling of the milk in cheese making.

It was found that milk pasteurized by the holding method curdled more slowly than nonpasteurized milk. This difference in time of curdling was

most marked when the pasteurized milk was cooled only to the temperature at which the rennet was introduced. Cheese from pasteurized milk lost moisture for a longer period than that from nonpasteurized milk. This period of moisture exudation was shortened by cooling the milk to a low temperature immediately after pasteurization. Cheese from pasteurized milk contained more protein and fat-free dry matter than that from nonpasteurized milk. More fat was lost in the curdling of pasteurized milk than of nonpasteurized milk, and this loss of fat was greatest when the pasteurized milk was cooled only to the temperature at which the rennet was added. The yield of cheese was smaller from the pasteurized milk than from the nonpasteurized.

[Cheese exports from Canada], J. A. RUDDICK (*Agr. Gaz. Canada*, 5 (1918), No. 3, pp. 242-244).—Notes are given on the export cheese situation in Canada. During 1917 there were accepted by the Cheese Commission for export to the United Kingdom 1,860,237 boxes of cheese weighing 155,662,463 lbs., the total exports of the year to all countries being about 172,620,000 lbs.

VETERINARY MEDICINE.

A textbook of bacteriology, P. H. HISS, JR., and H. ZINSSER (*New York and London: D. Appleton & Co., 1918, 4. ed., rev., pp. XXI+852, figs. 198*).—The fourth edition of this textbook (E. S. R., 32, p. 371) has been brought up to date by minor changes in the sections on immunity and bacteria in water and milk, by revisions of the chapters on streptococcus and paratyphoid and typhoid bacilli, and by new work on the Schick test and on the determination of virulence of the diphtheria bacillus. The most important change is the addition of a section on Pathogenic Protozoa, by F. F. Russell, which gives "concise information concerning the important pathogenic species, with special consideration to their common occurrence, the methods of their detection and recognition, and correlation to the diseases which they incite."

Conference of officers of the French and British army veterinary service, held in France, January 12, 1918 (*Vet. Jour.*, 74 (1918), Nos. 514, pp. 118-135; 515, pp. 157-167).—This is a report of the following addresses and accompanying discussions given at the conference: Glanders and Farcy, by J. Moore (pp. 120-124); Notes on Epizootic Lymphangitis, by W. A. Pallin (pp. 124-130); Ulcerative Cellulitis or Ulcerative Lymphangitis, by A. C. Newson (pp. 130-135); Periodic Ophthalmia, by A. C. Newson (pp. 157-161); and The Control and Treatment of Mange and Other Contagious Skin Diseases, by E. J. Wadley (pp. 161-166).

Some results of a survey of the agricultural zoology of the Aberystwith Area, C. L. WALTON (*Parasitology*, 10 (1918), No. 2, pp. 206-231).—This article includes a discussion of the occurrence of gid (*Multiceps multiceps*), one of the most troublesome diseases of sheep in the Aberystwith Area in Wales; *Echinococcus veterinorum* (*Tænia echinococcus*), cysts of which were obtained from the liver of a sheep that also contained specimens of *Distomum hepaticum*; "husk" or verminous bronchitis; *Syngamus trachealis*; *Ascaris suilla*; ticks; redwater; bloodsucking flies; warble flies; sheep maggot fly (*Lucilia sericata*); etc.

Annual administration report of the civil veterinary department, Madras Presidency, for 1916-17, D. A. D. AITCHISON (*Ann. Admin. Rpt. Civ. Vet. Dept. Madras Pres.*, 1916-17, pp. 22, pl. 1).—A report on the occurrence and treatment of diseases of live stock, including a report of the Madras Veterinary College.

Studies on immunity with special reference to complement fixation, A. BLUMBERG (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 7, pp. 397-408; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 21, p. 1568).—Complement fixations are classified in four groups in which (1) the antigens contain the specific organisms of a certain disease either in a saline emulsion or as an autolysate, (2) the antigen is essentially the liquid culture of a specific organism, (3) the antigen is the watery or alcoholic extract of tissues, and (4) no antigen is present. The use of these groups in the diagnosis of different diseases is reviewed and discussed. Special technique for complement fixation without an antigen is described and its application in determining pregnancy explained as follows:

To 10 test tubes containing increasing amounts of urine 0.5 cc. of 20 per cent complement, 0.1 cc. of 10 per cent sheep-blood emulsion, and 2 units of hemolysin are added. The amount of urine contained in the first tube presenting complete hemolysis is the titer. To conduct the test three tubes are set up for each specimen to be tested. The first tube contains the complete hemolytic system and 0.15 cc. of the urine, the second contains the complete hemolytic system and 0.25 cc. of the urine, while the third, or control tube, contains 0.25 cc. of the urine and the hemolytic system without complement. To each tube 1 cc. of physiologic saline is added, after which the tubes are well shaken and put in the incubator at 37° C.

In case no hemolysis results within an hour the test is considered negative for pregnancy, but if hemolysis occurs (usually within the first 25 to 30 minutes) the test is positive. If there is hemolysis in the third tube it is due to some cause other than pregnancy.

Cases are given illustrating the possibilities of the use of this test.

The relation of circulating antibodies to serum disease, W. T. LONGCORE and F. M. RACKEMANN (*Jour. Expt. Med.*, 27 (1918), No. 3, pp. 341-358, figs. 3).—The object of the investigation was to determine the relations existing between the formation of antibodies to horse serum and the course of serum disease. The presence of antibodies was demonstrated in patients suffering from serum sickness by the precipitin and anaphylactin tests and by the presence of a specific skin reaction. Observations were made at short intervals before, during, and after serum disease. The methods employed are described and tables and charts are given of results obtained, from which the following conclusions are drawn:

"The injection of horse serum either in small or in large amounts in human beings is always followed sooner or later by the development of hypersensitivity of the skin to subsequent injections of horse serum. For the development of this reaction serum disease is not essential. The blood serum of most patients who suffer from an attack of serum disease following injections of horse serum shows anaphylactin and precipitin for horse serum. Anaphylactin and precipitin can not be demonstrated in the blood serum of patients treated with horse serum who do not later present symptoms of serum sickness. The appearance of anaphylactin and precipitin precedes shortly recovery from the disease. With the appearance in the serum of antibodies to horse serum in great concentration, the antigen rapidly diminishes or disappears. It is probable that the extrusion of these antibodies into the circulation is the result and not the cause of serum sickness. Their presence serves to neutralize or destroy the antigen and thus determines the recovery from serum sickness."

A bibliography of 19 references to literature on the subject is appended.

Serum sickness, E. W. GOODALL (*Lancet [London]*, 1918, I, Nos. 9, pp. 323-327, figs. 3; 10, pp. 361-365).—This is a general discussion of serum sickness and its relation to anaphylaxis and to secondary rashes in acute infectious dis-

eases. It is the opinion of the author that in the clinical manifestations of serum sickness is found the key to the secondary rashes occasionally accompanying acute infectious diseases. The disintegration of the bacteria causing the disease sets free proteins which act slowly, giving rise to symptoms after several days.

The evolution of typhoid and paratyphoid fevers and of cholera.—Preventive vaccination and bacteriotherapy, J. DANYSZ (*Presse Méd. [Paris]*, No. 4 (1918), pp. 29-31; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 18, p. 1339).—The author discusses the infectious diseases acquired through the gastrointestinal canal and states that the infection is developed only in the case of individuals who are unable to digest completely the organisms of the disease and thus render them harmless. The course of the disease is determined by the amount of injected bacteria as well as by the intensity and rapidity of bacteriolysis and by the quantity of normal or preexisting antibodies—that is, the degree of natural or acquired immunity.

The bacteria are classified according to their prevalence in nature, their susceptibility to gastrointestinal digestion and absorption, and the digestibility of the absorption products. Typhoid bacilli are less frequent and more difficult to digest and form more severe lesions than the paratyphoid in man, although the latter are more difficult for certain animals to digest (hog cholera and typhoid in certain rodents). Colon bacilli are widespread in nature and the products of their bacteriolysis are very easily digested and are consequently seldom pathogenic. The reverse is true of cholera vibrio.

For all diseases of intestinal origin the best method of preventive vaccination is considered to be the prolonged ingestion of dead bacteria in progressively increasing doses. The best curative method is specific bacteriotherapy by fractionated intravenous injections or by frequently repeated ingestion.

The influence of secretin on the number of erythrocytes in the circulating blood, A. W. DOWNS and N. B. EDDY (*Amer. Jour. Physiol.*, 43 (1917), No. 3, pp. 415-428).—"It is possible to produce a considerable increase in the red corpuscle count per cubic millimeter of blood by the administration of secretin even in small doses and by subcutaneous injection. The most efficient dose is 1 cc. of secretin per kilogram of body weight. The increase in the count appears quickly and is very transient. By repeating the dose of secretin at short intervals the increase in the erythrocyte count can be kept up for several hours, but drops promptly after the administration of the last dose. The administration of secretin over a period of five days in daily doses of 1 cc. per kilogram of body weight has very slight, if any, lasting effect on the red corpuscle count in the normal animal."

Secretin.—II, Its influence on the number of white corpuscles in the circulating blood, A. W. DOWNS and N. B. EDDY (*Amer. Jour. Physiol.*, 45 (1918), No. 3, pp. 294-301).—"It is possible to produce an increase in the number of white corpuscles per cubic millimeter of blood by the administration of secretin, even in small doses and by subcutaneous injection. The most efficient dose is 1 cc. of secretin solution per kilogram of body weight. The increase in the count appears quickly and is very transient, but is greater and more persistent than the increase in the erythrocyte count produced by the same means. By repeating the dose of secretin solution at short intervals the increase in the number of both the erythrocytes and the white corpuscles can be kept up for several hours, but is more marked and persists somewhat longer after the last dose in the case of the white corpuscles than in the case of the red corpuscles. It is suggested that the effects described are due to a direct stimulating action of secretin on both the bone marrow and the lymphatic tissues in general.

The results of previous experiments on the number of erythrocytes in the circulating blood are confirmed."

Carrel's tube treatment for septic wounds as adapted to veterinary surgery, E. S. W. PEART (*Vet. Jour.*, 74 (1918), No. 514, pp. 136-149, figs. 11).—The treatment is a modification of Carrel's tube treatment in use for septic wounds in the human subject. The apparatus required is described with diagrams, and directions are given for the preparation of the antiseptics used (Eusol and Dakin's solution), the preparation and method of dressing the wounds, and the application of the antiseptic. Descriptions are given of several cases treated by this method with excellent results.

The mechanism of the action of anesthetics, W. E. BURGE, A. J. NEILL, and R. ASHMAN (*Amer. Jour. Physiol.*, 45 (1918), No. 4, pp. 388-395, fig. 1).—"Narcotics of widely different constitution, such as chloroform, ether, chloral hydrate, nitrous oxid, and magnesium sulphate, decrease the catalase of the blood, parallel with the increase in the depth of narcosis. A very powerful anesthetic, such as chloroform, decreases the catalase more quickly and extensively than does a less powerful anesthetic, such as ether. Slowly-acting anesthetics, such as chloral hydrate and magnesium sulphate, decrease, accordingly, the catalase of the blood more slowly than a quickly-acting anesthetic, such as nitrous oxid."

The theory is advanced that "narcosis is due to the direct destruction of catalase by the narcotic, with resulting decrease in oxidation, while recovery from anesthesia is brought about by an increase in catalase due to the increased output from the liver, with resulting increase in oxidation."

Chemical investigations on periodol, A. SCALA (*Ann. Ig. [Rome]*, 28 (1918), No. 2, pp. 57-67).—The author states that the disinfectant, periodol, previously noted by Sampietro (*E. S. R.*, 39, p. 80), is a mixture of potassium hypochlorite, chlorin, and iodin in combination with potassium chlorid and iodic. Dissolved in water containing carbonates, it decomposes with evolution of free chlorin and iodine, the decomposition being total or partial, depending upon the amount of carbonate in the solution and the concentration of the periodol. The antiseptic and sterilizing action of the periodol is due principally to the ease with which the nascent chlorin and iodine attack the protein material of the microorganisms, altering their structure or destroying their ordinary functions.

The ordinary water solution of periodol can be rendered stable by the addition of 10 per cent of common salt.

Apparatus for use in examining feces for evidences of parasitism, M. C. HALL (*Jour. Lab. and Clin. Med.*, 2 (1917), No. 5, pp. 347-353, figs. 3).—The author here describes certain changes in the apparatus used in examining feces, as described in the bulletin previously noted (*E. S. R.*, 25, p. 150) and a subsequent edition with addenda, which he has found advantageous.

A highly differentiating polychromatic toluidin-blue stain, M. BARRON (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 7, pp. 432-434).—In the preparation of the stain the polychromatic qualities of toluidin-blue are increased by boiling with an alkali such as potassium carbonate. The method of preparation of the stain and colors obtained in its use are described. The stain is said to be particularly valuable for the examination of feces for ova and parasites and in identifying diphtheria bacilli.

On the development of *Ascaris lumbricoides* and *A. mystax* in the mouse, II, F. H. STEWART (*Parasitology*, 10 (1918), No. 2, pp. 189-196, pl. 1).—This is a report of investigations, carried on in continuation of those previously noted (*E. S. R.*, 37, p. 374), in which the larvæ of *A. lumbricoides* were traced in the rat and mouse from the ninth to the fifteenth day after infection, but not later.

"Larvæ are found in the mouths of infected mice on the eighth day, on which day they are also abundant in the lungs and trachea. They persist in the lungs up to the fifteenth day. On the ninth day they begin to travel down the alimentary canal and may be found in small numbers in the stomach, small intestine, and cecum. On the tenth day this stage is fully established, the larvæ travel with some rapidity through the stomach and small intestine and accumulate in the cecum and upper colon, where as many as 60 to 70 may occur. On this day they also commence to pass out in the feces. The passage from the lungs to the cecum continues up to the fifteenth day, and larvæ occur in the feces on the sixteenth day. Between the ninth and fifteenth days the larvæ increase in length. They measure from 1.3 to 2 mm. on the tenth day and 1.75 to 2.37 mm. on the fifteenth."

Ripe eggs of *A. mystax* (*A. marginata*) were administered to mice in their food, and active larvæ were found in the liver between the first and third days after infection.

See also a paper by Ransom and Foster previously noted (E. S. R., 38, p. 335).

A note regarding myiasis, especially that due to syrphid larvæ, M. C. HALL (*Arch. Int. Med.*, 21 (1918), No. 3, pp. 309-312).—A brief review of the subject with references to the literature.

Erysipelas in pigeons and ducks, and culture differences in erysipelas bacilli, J. POELS (*Folia Microbiol. [Delft]*, 5 (1917), No. 1, pp. 1-18).—The author reviews the literature on the subject of erysipelas in swine, mice, pigeons, etc., and discusses particularly the symptoms and culture characteristics of the disease in pigeons and ducks.

The conclusion is drawn that the disease is caused by different strains of the same bacillus possessing different culture characteristics, as follows: (1) The erysipelas bacillus proper, which grows in gelatin along the inoculation stab in small kernel-shaped colonies, seldom forming filaments; (2) a bacillus which shows in a gelatin stab a strong tendency to rapid formation of filaments; and (3) a form which develops very slowly. The first strain has a predisposing tendency for swine and birds, the second is found in the erysipelas of mice and in polyarthritis of sheep, and the third is found in swine that have died of erysipelas in an epizootic form. These strains may also be recognized by the differences in rapidity of growth in gelatin culture. All the strains can produce erysipelas in swine, but the first and second do so only under a strong predisposing influence.

The erysipelas serum has generally the strongest curative influence toward the third strain of bacilli.

Some remarks and suggestions on the vaccine and serum methods of treatment of ulcerative lymphangitis, E. A. WATSON (*Vet. Jour.*, 74 (1918), No. 515, pp. 170-175).—The author offers suggestions for the observation of horses which have received the vaccine and serum treatment for ulcerative lymphangitis in order to determine whether such treatment is permanent or temporary. A comparison is reported of the efficacy of four modes of treatment of the disease as observed in groups of five animals each. The serums and vaccines used were (1) serum obtained from horses immunized to large doses of virulent cultures of Preisz-Nocard bacilli, (2) anti-Preis-Nocard vaccine prepared by the alcohol-ether method, (3) polyvalent mixed vaccine containing mixed strains of pyogenic streptococci, staphylococci, and Preisz-Nocard bacilli, originating from ulcerative lymphangitis lesions, and (4) pus vaccine serum prepared from pus collected from unopened abscesses and from purulent kidneys in cases of the disease.

The best results were obtained by the use of serum and anti-Preisz-Nocard vaccine and the anti-Preisz-Nocard vaccine alone, all cases remaining apparently cured. Rapid improvement followed the use of serum and pus vaccine or of the latter alone, but it was not always maintained. The pus vaccine is not rich enough in Preisz-Nocard bacilli to produce the required amount of antibodies to overcome severe infection.

The point of election and modes of invasion in pulmonary tuberculosis, J. O. COBB (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 21, pp. 1511-1516, figs. 5).—The author summarizes the experimental evidence regarding the modes of invasion of the tubercle bacillus in pulmonary tuberculosis, and concludes that it is a fair assumption that, commonly, infection in man and animals is by the ingestion method. This does not lessen the potential danger of infected dust, as much of this dust would be swallowed, even though planted on respiratory mucous membranes by inhalation.

Possible causes for the initial point of lodgment of the organism in the apexes of the lungs in man and in the caudal lobe of the cow's lung are discussed. Since no portion of the lung possesses a specific biochemical constituent that would sensitize it to the bacillus and since the bacillus does not possess selective properties in any special portion of the lung, it is concluded that the lodgment of bacilli in the superior part of the lungs in both the cow and man is due to mechanical causes influencing them along unusual lines.

The intradermal or intracutaneous tuberculin testing of guinea pigs, J. TRAUM (*Cornell Vet.*, 8 (1918), No. 1, pp. 2-6).—In the author's work definite reactions to the intradermal test, which is considered to be the most desirable test for suspected guinea pigs, appeared in some instances by the twelfth day after the inoculation of tuberculous material but experience has shown that uniformly good results are not to be looked for before the sixteenth day. That certain nontuberculous guinea pigs retested in 11 and 12 days responded is considered by the author to be due to the fact that the initial injection of tuberculin had a sensitizing effect and that the second injection was given at a time when this effect was at its height.

The failure of tuberculous guinea pigs to react to this test is exceedingly rare and consists principally of (1) animals suffering from acute intercurrent diseases; (2) animals in the very last stages of the disease when the resistance is entirely broken down; (3) pregnant animals at times; (4) animals in which hypersensitiveness is so great that even the usual dose will kill them before sufficient time has elapsed for the appearance of the local reaction; and (5) animals in which tuberculous foci have not developed.

Eradication of tuberculosis in animals, H. R. SMITH (*Amer. Jour. Vet. Med.*, 13 (1918), No. 3, pp. 140-143).—This is part of a discussion by the author at the annual meeting of the United States Live Stock Sanitary Association, held in Chicago, in December, 1917.

Effect of tuberculin test on milk yield, J. J. HOOPER (*Breeder's Gaz.*, 73 (1918), No. 20, p. 1032).—In order to determine whether the tuberculin test reduces the milk flow, tabulations were made at the Kentucky Experiment Station of milk produced by 10 cows before and after the test.

The cows gave an average of 21.45 lbs. of milk daily for three days preceding and succeeding the tuberculin test and on the two days of the test an average of 20.98 lbs. As this is a practically inappreciable decrease, the author states that there need be no hesitancy in using the tuberculin test on the ground that there will be a reduction in the milk flow. It is recommended that every herd be tested once or even twice a year.

Further studies on *Bacterium abortus* and related bacteria, I, II, ALICE C. EVANS (*Jour. Infect. Diseases*, 22 (1918), No. 6, pp. 576-593, figs. 3).—Two papers are presented:

I. *The pathogenicity of B. lipolyticus for guinea pigs* (pp. 576-579).—A series of inoculation and feeding experiments with guinea pigs were conducted to determine whether *B. abortus* var. *lipolyticus*, previously noted (E. S. R., 35, p. 674), might cause disease-producing properties. The author concludes that "although these experiments do not demonstrate the harmlessness of *B. lipolyticus* as clearly as could be desired, due to the complications with the two contagious infections, no evidence was found to show that it is pathogenic for guinea pigs."

II. *A comparison of B. abortus with B. bronchisepticus and with the organism which causes Malta fever* (pp. 580-593).—The three organisms *B. abortus*, *B. bronchisepticus*, and *B. melitensis* are described in detail and compared as to morphology, staining, cultural characteristics, and biochemical reactions. Their comparative pathogenic action was determined by inoculation tests with guinea pigs, and by subsequent agglutination and absorption tests.

The results show that *B. abortus* and *B. bronchisepticus* are closely related. *B. bronchisepticus* can be easily distinguished from *B. abortus* by its motility, its more rapid and abundant growth in all artificial media, its more intense alkaline reactions, and its agglutination in *B. abortus* immune serum only in low dilutions. *B. melitensis* is even more closely related to *B. abortus*, the only distinguishing property being the agglutination of *B. melitensis* suspensions in higher dilutions of *B. melitensis* serum than will agglutinate suspensions of *B. abortus*.

The close relationship between *B. abortus* and *B. melitensis*, which is pathogenic to human beings, is considered by the author to add a new interest to the question of the possible pathogenicity of *B. abortus* to human subjects. As a possible explanation of the fact that in spite of the frequency of virulent strains of *B. abortus* in cow's milk, a disease resembling Malta fever is not prevalent in this country, it is suggested that the actual number of virulent bacteria in cow's milk is small in comparison with the number of *B. melitensis* in the milk of goats in Malta. The question is raised, however, whether cases of glandular disease or cases of abortion, or possibly diseases of the respiratory tract, may not occur among human subjects in this country as a result of drinking raw cow's milk.

Contagious abortion disease in cattle, W. GILTNER and G. M. POTTER (*Amer. Jour. Vet. Med.*, 13 (1918), No. 3, pp. 105-110, 155, 156).—This is a report prepared by a committee of the United States Live Stock Sanitary Association and presented at the twenty-first annual meeting of the association, held in Chicago in December, 1917.

In order to ascertain where and to what extent the disease exists, what efforts are being made to control it, views as to the methods of dissemination, and the most practical measures for combating it, a questionnaire was addressed to investigators, State veterinarians, directors of experiment stations, and practitioners. Replies were received from approximately 30 States and 60 individuals, and are summarized under the headings of history and distribution, cause, dissemination, persistence, organs involved, diagnosis, attendant conditions, immunity, etc.

The story of the cattle fever tick.—What every southern child should know about cattle ticks (*U. S. Dept. Agr. [Pub.], 1917, pp. 31, figs. 28*).—This is a popular account, intended particularly for children, in which the life

history and habits, economic importance, and means for the eradication of the cattle tick are described.

Contribution to the study of the diseases of calves.—Broncho-pneumonia caused by colon bacilli, L. COMINOTTI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig.*, 41 (1918), No. 7, pp. 167-173).—Experimental evidence is given proving that colon bacilli can produce in calves broncho-pneumonia of a subacute type. The first symptom of the disease is a gradually increasing cough, followed by loss of appetite and rise in temperature. The pulmonary lesions are similar to those of ordinary broncho-pneumonia, the alveolar spaces being filled with leucocytic material. Occasionally there is hypertrophy of the lymphatic ganglia. Nodular formations are sometimes present from which *Bacillus coli* can be isolated. In some cases the disease becomes localized in the joints, probably due to a secondary reaction caused by streptococci.

Dehorning and castrating cattle, F. W. FARLEY (*U. S. Dept. Agr., Farmers' Bul.* 949 (1918), pp. 13, figs. 12).—A popular account.

Liver rot of sheep and bionomics of *Limnæa truncatula* in the Aberystwith Area, C. L. WALTON (*Parasitology*, 10 (1918), No. 2, pp. 232-266, figs. 5).—In the survey conducted as noted on page 283 in Wales particular attention was given to the study of liver rot of sheep and the bionomics of *L. truncatula*, its host snail, the results of which are here reported upon.

Investigations concerning the sources and channels of infection in hog cholera, M. DORSET, C. N. McBRIDE, W. B. NILES, and J. H. RIETZ (*Jour. Agr. Research [U. S.]*, 15 (1918), No. 2, pp. 101-131, fig. 1).—Investigations conducted by the Bureau of Animal Industry of the U. S. Department of Agriculture with the view of determining the manner in which hog cholera may be transmitted are summarized by the authors as follows:

"The eye and nose secretions, the blood, the urine, and the feces of cholera-infected pigs were tested on the first, second, third, fifth, seventh, and ninth days after infection. When injected, the eye and nose secretions and fecal suspensions were found to be infectious on the third day; the urine was quite regularly infectious by the fourth or fifth day, and the blood was infectious as early as the first day. When fed and when scattered in pens, the freshly collected secretions and excreta were noninfectious as a rule. Secretions and excreta which were held at room temperature (60 to 85° F.) for 24 hours remained infectious when injected. When the secretions and excreta were held at the same temperature for 48 hours the urine and feces remained infectious, but the eye and nose secretions were no longer so. It might appear, therefore, that outside the animal body the virus in the eye and nose secretions succumbs more quickly than the virus in the urine and feces, but such a conclusion is not justified by these experiments, as the virus from the eye and nose was allowed to dry on swabs. This point requires further study with the virus from the different sources held under identical conditions. Finally, it should be noted that the eye and nose secretions may be infectious before there is any visible discharge from the eyes or nose.

Susceptible pigs were exposed by association with cholera-infected pigs for 48-hour periods on the first, third, fifth, seventh, ninth, and eleventh days after infection. With the exception of those exposed on the first and second days—that is, during the first 48-hour interval—all of the exposed pigs contracted hog cholera. Other pigs which were exposed to cholera-infected pigs at 17 and 21 days contracted hog cholera. Cholera-infected pigs therefore may transmit the disease by contact at practically all stages of the disease, even in the period of incubation, before the appearance of visible symptoms and before the animal can be recognized as sick.

"Susceptible pigs were exposed by being placed in pens with pigs which had suffered from typical attacks of hog cholera but had recovered. Other susceptible pigs were inoculated with blood drawn from the recovered pigs. Four recovered pigs were tested in this way to determine whether they harbored the virus of cholera within their bodies and might act as carriers of the disease. None of the pigs exposed to the recovered pigs, either by association or by blood injection, developed hog cholera. The exposed pigs were later proved to be susceptible by virus injection.

"Susceptible pigs were exposed for long periods of time to pigeons, which passed daily from a heavily infected pen only 10 ft. away and which contained sick and dying pigs, to a pen containing susceptible pigs. The exposure in these experiments was severe, as the pigeons were afforded every opportunity to carry the infection over a very short distance. Notwithstanding this, none of the exposed pigs developed cholera. All of the exposed pigs were later proved to be susceptible either by virus injection, by association directly with sick pigs, or by exposure in an infected pen. These experiments extended through the fall and well into the winter. While the assumption would hardly be warranted that pigeons never convey hog cholera, it does not seem likely that they are often concerned in the spread of this disease.

"Rats were fed on the meat of cholera hogs for periods of 5 and 21 days. The rats were then killed, their entire bodies chopped up, mixed with bran mash, and the mixture was fed to susceptible pigs. None of the pigs thus fed contracted cholera. The pigs were proved to be susceptible by subsequent virus injection."

Epizootic lymphangitis and cutaneous blastomycosis in horses, G. DEGREEF (*Bul. Agr. Congo Belge*, 8 (1917), No. 3-4, pp. 307-311).—This is a general article describing the causal agent, *Cryptococcus farciminosus*, and various clinical forms of the disease as observed by the author.

[Treatment of parasitic mange] (*Vet. Rev.*, 2 (1918), No. 1, pp. 52-55).—A review of recent literature on scabies in the horse and measures for its control.

Treatment of mange in the horse by nicotin, QUERRUAU (*Rev. Gén. Méd. Vét.*, 26 (1917), No. 309, pp. 405-414; *abs. in Vet. Rev.*, 2 (1918), No. 1, pp. 53, 54).—For the treatment of mange in horses under army conditions the author recommends the application of a dressing consisting of extract of nicotin 30 gm., water 1,000 gm., and carbonate of sodium 3 gm. The procedure of treatment is outlined as follows: First day, dry rubbing of the anterior half of the body, followed by the application of from 2 to 3 pints of the dressing; third day, rubbing and the application of the dressing to the posterior half of the body; and fifth and seventh days, repetition of the treatment outlined for the first and third days, respectively.

Infectious asthenia of fowls, A. G. G. RICHARDSON and R. E. REBRASSIE (*Vet. Alumni Quart. [Ohio State Univ.]*, 5 (1918), No. 3, pp. 76-79).—The authors' experiments in Ohio substantiate the conclusions of Dawson (E. S. R., 11, p. 994) that asthenia in fowls is caused by *Bacterium astheniae*. It appears that in order to produce the disease artificially the bacillus must be introduced directly into the duodenum.

RURAL ENGINEERING.

The wet lands of southern Louisiana and their drainage, C. W. OKEY (*U. S. Dept. Agr. Bul.* 652 (1918), pp. 67, pls. 2, figs. 15).—This is a revision of Bulletin 71 (E. S. R., 31, p. 185) embracing results of later observations and including a discussion of the problems involved in land drainage by means of

pumps in Louisiana, in continuation of a previous bulletin dealing with pumping in the Upper Mississippi Valley (E. S. R., 34, p. 283).

"The drainage of these lands has been uniformly successful, and from the drainage engineer's standpoint the work is now well past the experimental stage. Where successful drainage has not been attained it has been due to insufficient and poorly constructed improvements rather than to inherent and insurmountable difficulties. On some of the districts the improvements have been installed without competent engineering advice and services, and while successful drainage has been secured in some such cases, it was not secured with the greatest economy. The earlier faults were due principally to attempts to drain the land too cheaply. This has been demonstrated to be false economy, and the present practice is almost uniformly of such a grade as will ultimately result in the complete drainage of the lands of this section."

The case against hard water, R. HULBERT (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 2, pp. 22-27).—A part of this article deals with hard water and health. The question as to whether the presence of large amounts of hardening salts in drinking water may cause certain diseases such as constipation, dyspepsia, impairment of digestion, diarrhea, goitre, and the formation of urinary and biliary calculi is discussed and the opinions of certain authorities cited. The conclusion is reached that probably moderately hard water is not injurious and is not therefore necessarily inferior to soft water for drinking. The consensus of medical opinion is, however, emphatically in favor of soft water for drinking where this can be obtained free from organic impurities and unnatural ingredients.

The disadvantages of hard waters in laundry work, cooking, and for use in boilers are also discussed.

Public Roads (*U. S. Dept. Agr., Public Roads*, 1 (1918), No. 1, pp. 44, figs. 14).—The initial issue of this periodical discusses its proposed scope, and presents several articles and notes dealing with various phases of road construction and maintenance. A complete compilation of all State projects submitted up to February 28, 1918, under the Federal Aid Road Act and rulings under the act are presented. Data as to motor-car registration, by A. P. Anderson, are included, and an article entitled Saving Fuel in Highway Work, by G. E. Ladd.

The preservation of wood, A. J. WALLIS-TAYLER (*London: William Rider & Son, Ltd.*, [1918], pp. XIX+344, figs. 119).—A descriptive treatise on the processes and mechanical appliances used for the preservation of wood. The successive chapters discuss the destruction of wood by decay and the ravages of insects, seasoning or drying wood, the preservative treatment of wood, principal preservative agents and processes, various proprietary and other preservative solutions, the absorption limit and life of preserved wood, fireproofing and fire-retardant treatment of wood, and cost of preservative treatment. Various formulas, tables, memoranda, etc., are appended.

Care and repair of farm implements.—No. 3, Plows and harrows, E. B. McCORMICK and L. L. BEEBE (*U. S. Dept. Agr., Farmers' Bul.* 946 (1918), pp. 9, fig. 1).—Suggestions are given for the care and repair of various types of plows and harrows.

Care and repair of farm implements.—No. 4, Mowers, reapers, and binders, E. B. McCORMICK and L. L. BEEBE (*U. S. Dept. Agr., Farmers' Bul.* 947 (1918), pp. 15, figs. 8).—Suggestions are made for the care and repair of these implements.

A rotary seed harvester for crimson clover, A. J. PIETERS (*U. S. Dept. Agr., Bur. Plant Indus., F. C. I.* 47 (1918), pp. 8, figs. 7).—A description is given of

a machine developed from the device previously noted by Westgate (E. S. R., 32, p. 732). Public-service patents for this machine have been taken in the name of J. F. Barghausen.

Tests made with the machine in a field of somewhat immature crimson clover at Raleigh, N. C., are reported, together with a subsequent test by R. E. L. Yates, of the North Carolina College.

It was found that a rotary seed harvester of this type will do its best work when the ground is relatively level and the clover dry, and with at least 75 per cent of the seed ripe. It is claimed that under these conditions upward of 90 per cent of the seed should be harvested, and that under favorable conditions nearly 10 acres a day can be harvested.

RURAL ECONOMICS.

Farm profits and factors influencing farm profits on 284 general farms and 75 dairy farms in Monmouth County, N. J., F. APP (*New Jersey Stat. Bul. 312 (1917)*, pp. 7-89, pls. 8, figs. 6).—This bulletin contains two reports, one relating to 284 farms located in Upper Freehold and Millstone Townships, Monmouth County, N. J., and the other to 75 dairy farms also located in the same county. Among the conclusions brought out by the author were the following:

The average labor income for general farms operated by owners was \$491, for those operated by part owners, \$760, and for those by tenants, \$653. Cash renting rather than share renting gave the tenants the larger labor income. Landlords received 6.1 per cent on their capital invested, not including rise in land values. The average farm investment was \$13,602 for farm owners, \$3,014 for tenants, and \$13,437 for landlords. The owner farms averaged 68.8 crop acres and 110.4 farm acres, and tenant farms, 91 crop acres, 136.9 farm acres. Owners having over 151 crop acres received \$2,145 labor income, and similar tenant farms, \$1,695. The margin of receipts above expenses increased with each additional investment for fertilizer and labor, so far as they were made on farms having yields above the average. Men and horses care for as many (or more) crop acres on the high as on the low producing farms. The owners obtained 211.9 work units and tenants 235.4 work units per man. The major measures of success for these farms were size, production, and number of work units per man; the minor measures of success were largely productive live stock, proper proportion of stock and crops, proper crop rotation, work units per horse, and distance from railway.

The labor income for the 75 dairy farms was \$937 per farm. Farm owners had \$14,582 invested per farm, cash-renting landlords \$11,700, share-renting landlords \$14,583, cash tenants \$3,699, and share tenants \$2,416. On the 75 dairy farms, representing an average investment of \$14,949, \$11,080 was invested in real estate, \$2,356 in live stock, \$747 in machinery, \$435 in feed and supplies, and \$331 in cash. The number of crop acres on the owner dairy farms averaged 66.6, and the farm area 106.3 acres, while the tenant farms averaged 78 crop acres and 165 farm acres. Large dairy farms were more efficient in their use of man, horse, and machine labor. "Expenses per crop acre increase with increased production but not nearly so rapidly as receipts. Men on farms receiving the highest receipts per cow made the largest labor income."

A farm-management survey in Brooks County, Ga., E. S. HASKELL (*U. S. Dept. Agr. Bul. 648 (1918)*, pp. 59, figs. 21).—The 106 farms surveyed in this area, which was selected because within it has been developed a diversified and

profitable type of agriculture, with cotton retained as the chief single source of income, averaged in size 331 acres, of which 145 acres were devoted to planted crops. Three-fourths of the average farm capital consisted of real estate, the other fourth working capital. For every acre of land in crops these farms had \$7.34 invested in live stock, \$4.66 in feed and supplies, and \$2.28 in implements and machinery. The average market price of the land was found to be \$20.50 per acre, while the crop land alone was valued at \$30.30 and would rent for \$3.09.

The total number of animal units per farm was 23.6, of which cows comprised 12.2, swine 11.1, work stock 4.4, poultry 0.7, and others 0.2. Fifty and two-tenths per cent of the receipts were from cotton, 15.7 from swine, 4.4 from cattle and products, 5.6 from corn, 2.6 from miscellaneous crops, 6.1 from oats and rye, 5.8 from watermelons, 3 from feed and supplies, 1.1 from poultry and eggs, 1.5 from sugar cane and sirup, 1.7 from cowpea hay, 1.7 from miscellaneous receipts, and 0.6 from other live stock.

It was found that the cropper's average receipts were \$388.70 and his expenses \$130.26, making his net income \$258.44. It is estimated that \$138.60 was the amount that he would have received for the same labor had he been working for wages.

The bulletin discusses in detail the labor system, the size of business, the quality of farm business, organization, and the cost of production for principal crops.

A farm-management study in Anderson County, S. C., A. G. SMITH (*U. S. Dept. Agr. Bul. 651 (1918), pp. 32, figs. 6*).—This is a digest of a farm-management and cost-determination survey of 112 farms in Williamston, Belton, Broadway, and Honeapath Townships, in Anderson County, S. C. A correlation study made from the data secured showed that as far as the methods used on these farms were concerned yields constituted 62 per cent, acres per work animal 22 per cent, and the combination of enterprises 16 per cent of the total weight of these three factors in influencing the percentage return on the investment.

The more important facts brought out by this bulletin are that the cost of producing cotton was 10.89 cts. per pound gross lint, corn \$1 per bushel, oats 43.3 cts. per bushel, oat hay \$13.88 per ton, and cowpea hay \$14.10 per ton. Cotton was produced at its market value when yields were 240 lbs. of net lint per acre and corn when yields were 17 bushels per acre.

The farms that planted from 20 to 23 acres of crops per work animal were the most profitable. Farms that had from 21 to 25, 41 to 45, and 61 to 65 acres of crops, good sizes, respectively, for one, two, and three mule farms, were more profitable than those that had intermediate sizes. The farms made an average of 3.65 per cent on the investment.

The cost of producing feed crops is such that it is profitable to grow them only in sufficient quantities to insure a supply for home consumption. The tendency of farmers and the most profitable procedure is to grow the necessary home supplies and then grow all the cotton that conditions permit.

As a general proposition where from 20 to 23 acres of crops are planted per work animal 40 per cent should be planted in field crops and 60 per cent in cotton.

Farm organization in the irrigated valleys of southern Arizona, R. W. CLOTHIER (*U. S. Dept. Agr. Bul. 654 (1918), pp. 58, figs. 12*).—This bulletin presents the results of a farm survey of 627 farms located in the Salt River, Gila, and Yuma valleys, Arizona. Among the conclusions drawn by the author were that over 25 per cent of the farms in the three valleys failed to pay cur-

rent interest rates on investments, owing largely to a farm organization based primarily on relatively unprofitable enterprises.

Dairying was found to be the most staple as well as the most popular enterprise in the valleys, contributing 67.7 per cent of the receipts on 178 farms. Growing alfalfa for hay ranked next in popularity.

"Cotton farming is a new enterprise, based on an acclimatized variety of Egyptian cotton which promises to be a profitable rotation crop with alfalfa. Grain farming is relatively profitable only on the cheaper lands. Poultry raising is a profitable enterprise, especially on the small farms, and is an important side line on farms of all sizes.

"Fruit farming is relatively profitable on the small farms, though fruit lands are so highly valued that they often fail to pay current interest rates on their valuation. They furnish a relatively high standard of living and a relatively low standard of wages to the farmer. Trucking and gardening are unpopular, and are believed by most of the farmers in the districts to be unprofitable. Cantaloups are highly speculative, sometimes returning high profits and sometimes failing to pay freight bills on shipments.

"Diversified farming when based on dairying or poultry is relatively more profitable than hay farming but not as profitable as dairying. It has made its best development on farms of medium size where dairying and poultry are strongly emphasized among the diversified enterprises. Some adaptation of type to size of farm is necessary, poultry raising, dairying, and fruit farming being required on small farms, dairying being adapted to the farms of medium size, and the beef-cattle enterprise giving the best returns on the larger farms."

Lease contracts used in renting farms on shares, E. V. WILCOX (*U. S. Dept. Agr. Bul. 650 (1918), pp. 36*).—This report is based on a study of 258 lease contracts and farm-survey records from 2,907 farms covering the principal types of farming.

It was found that in the majority of cases the leases run for only one year, usually with the privilege of renewal on one or two months' notice. The bulletin discusses the methods of sharing crops and live-stock produce; methods of sharing pasture; contracts for clearing land; ownership of equipment; methods of sharing expenses; unexhausted value of fertilizers; repairs and improvements; privileges and perquisites; restrictions; supervision by the landlord; and the general system of share leasing. The author states that an obvious assumption underlying adjustments in the various types of contracts is that the landlord of more fertile land is entitled to a larger share of the crop than the landlord possessing poor land under otherwise similar conditions. A sample stock share lease, together with suggestions toward a rational lease contract, are included.

The farm labor problem, C. OUSLEY (*U. S. Dept. Agr., Office Sec. Circ. 112 (1918), pp. 10*).—The author maintains that there is man power sufficient in the United States to plant and harvest the desired farm crops if properly mobilized by cooperation and community action. He points out the influence of the draft upon farm labor supply and the availability of town men of farm experience, boys who are members of the boys' working reserve, women, idlers, and loafers. He calls attention to the cities' responsibility in aiding in the solving of the local farm-labor problem, and also to the recent report of the advisory committee of farmers and live-stock producers with reference to this problem.

Report of advisory committee of agricultural and live-stock producers (*U. S. Dept. Agr. [Pub.], 1918, pp. 32, fig. 1*).—This report contains statements of the Secretary of Agriculture and the Food Administrator to the advisory committee of agricultural and live-stock producers at a consultation in Wash-

ington, D. C., March 28 to April 4, together with information concerning the personnel of the advisory committee. The functions of the committee are explained and advice on remedial measures was requested from the committee concerning some of the agricultural problems of the country. Among these are included the question of price as it is effected by government buying; the handling of the sugar and other crops; the obtaining of nitrate; the extension of the seed service; questions of farm labor and machinery; of live stock and dairying.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 5, pp. 45-56, figs. 4*).—This report contains data regarding the condition May 1 of winter wheat, rye, hay, and spring pasture, and the percentage of spring plowing and planting done on May 1, the estimated farm value of important products on April 15 and May 1, the average prices received by producers, and the range of prices of agricultural products at important markets. It also contains special reports on the condition of the peaches, production of maple sugar and sirup, crop conditions in Florida and California, crop acreage by States, Louisiana sugar-cane acreage, stocks of hay May 1, acreage and yield of edible dried peas in important producing States, index figures of crop prices, percentage of farms reporting various crops and live stock (1910 census), winter-sown oats acreage, the relative supplies of crops on farms January 1, the honey bee and condition of colonies May 1, an estimate of the time when the crop of potatoes is disposed of, a statistical article with reference to the southern production of cowpeas, soy beans, velvet beans, and peanuts, etc.

Farmers' market bulletin (*North Carolina Sta., Farmers' Market Bul., 5 (1918), Nos. 21, pp. 7; 22, pp. 9; 23, pp. 7*).—These numbers contain the usual list of products which farmers have for sale, together with special reports on the demand for Irish and sweet potatoes, and the mill price for corn, by W. R. Camp.

AGRICULTURAL EDUCATION.

Allotment of agricultural education and research, M. CUMMING, W. R. REEK, J. A. GRENIER, W. B. ROADHOUSE, R. FLETCHER, J. McCAIG, and L. S. KLINCK (*Agr. Gaz. Canada, 5 (1918), No. 3, pp. 267-272*).—This is a series of brief articles by Government officials, outlining the organization and control of agricultural education and research in the various Provinces of Canada.

In Nova Scotia the heads of the various divisions of the department of agriculture are also the heads of the corresponding divisions of the college of agriculture, and the director of rural education of the department of education has charge of the agricultural education in the schools, including school fairs, school gardens, etc. He frequently secures the services and always has the cooperation of the officers of the department of agriculture.

The New Brunswick Department of Agriculture carries on all agricultural extension or educational work, and in agreement with the department of education also supervises the work of elementary agricultural education.

In the Province of Quebec matters pertaining to agriculture, even the school fairs, are under the direction of the department of agriculture, which receives full cooperation from the department of public instruction and school inspectors as regards the teaching of agriculture in the schools. Macdonald College, which conducts a large number of researches and experiments, and the agricultural schools of Ste. Anne de la Pocatière and Oka also cooperate closely with the department of agriculture.

In Ontario all the agricultural work comes under the department of agriculture, including the administration of the Ontario Agricultural College, the Ontario Veterinary College, the proposed new agricultural school at Kempt-

ville, and the experimental farms in the Province. At the same time the agricultural college and the veterinary college are affiliated with the University of Toronto for academic purposes and the degrees for the final year are presented by that university. Both of these colleges are presided over by presidents who are directly responsible to the minister of agriculture. The research work is also a branch of college activities, particularly of the Ontario Agricultural College, but does not come under the university authorities. Practically all of the extension work of the department is directed from its head office at Toronto, with close cooperation between the officers in charge and the professors and experimental staff of the colleges and farms. The department of education has the administration of the other educational bodies in the Province, including public schools, high schools, collegiate institutes, and universities, and has entire control of the instruction in agriculture given in the public and high schools. In planning the agricultural work conferences are held between the officials of the departments of education and agriculture so that the former may have the benefit of the special training of the latter.

The Manitoba Department of Education is in close cooperation with the extension department of the Manitoba Agricultural College, and matters relating to agricultural education affecting the pupils in the schools are submitted to it for approval before being put into effect.

In Alberta research work is centered in the university, except that in the three provincial agricultural schools, which are interposed between the university and the public schools, there is some research and experimental work carried on. The agricultural schools and popular and short courses are administered and organized wholly by the department of agriculture. The university and department cooperate fully in all kinds of lecture and instruction work. The department of education controls the school-garden work, which is encouraged by special grants, and also cooperates with the department of agriculture in the work of the district agents, which up to the present has been largely taken up with organizing home gardens and conducting school fairs. The department of education gives special courses in agriculture to fit teachers for their work. Its teaching of agriculture in secondary schools is limited to teaching and directing a course in the high schools which is compulsory for those taking a teacher's course.

As the result of two conferences of representatives of the departments of agriculture and education of British Columbia and the University of British Columbia, held in November, 1917, it was agreed that all agricultural research, whether conducted at Point Grey or at some other center in the Province, be under the university authorities. All agricultural courses exceeding three days' duration in which particular emphasis is placed on the science underlying the principles taught would be conducted in future by the university rather than by the department of agriculture. The department of agriculture is to conduct all illustration and demonstration field work and all work having for its object increased agricultural production, and continue to publish popular bulletins whether prepared by department officials or by members of the staff of the university. Full cooperation between the university and the departments of agriculture and education is projected, including the interchange of instructors when deemed advisable. Continuation classes in agriculture under the department of education are to be open to both young men and young women students who have attained the age of 15 years. A tentative arrangement is to be arrived at between the departments of agriculture and education whereby the minimum age limit for membership in boys' and girls' clubs would be fixed at 11 years for 1918 and 12 years for 1919, and the scope of the competition in these clubs is to be extended to include special projects for girls.

In Saskatchewan the arrangement of work as between the departments of agriculture and education and the university is practically the same as that obtaining in British Columbia.

Report of the commission on the investigation of agricultural education (*Boston: Wright & Potter Printing Co., 1918, pp. 61*).—This report of the special commission appointed in 1916 for the purpose of investigating the subject of agricultural education as conducted at the Massachusetts Agricultural College and the development of the agricultural resources of the Commonwealth, has been previously noted (*E. S. R., 38, p. 301*).

Duty of our State legislators to our agricultural institutions, W. H. JORDAN (*N. Y. Dept. Agr. Bul. 92 (1917), pp. 127-134*).—An address in which the relation of the State to some problems of station administration is specially discussed.

Some documents on the history of agricultural education in Mexico (*Algunos Documentos para la Historia de la Enseñanza Agrícola en México. Mexico: Govt., 1912, pp. [2]+130*).—This is a detailed history of the National School of Agriculture at San Jacinto, D. F., Mexico.

Rural relations of high schools, C. J. GALPIN and J. A. JAMES (*Wisconsin Sta. Bul. 288 (1918), pp. 44, figs. 18*).—This bulletin consists of two parts, dealing respectively with the social and agricultural relations of high schools.

Attention is called to the increasing value of headwork on American farms through the gradual replacement of the "hoe farmer" by the "machine farmer" and the consequent necessity of high-school education for the farmer. It is suggested that, inasmuch as only about one-eighth of the area of Wisconsin is included in high-school districts, by some form of agreement responsibility for educational ideals over the natural and legitimate rural area of influence adjoining each high-school district be apportioned among the existing high-school boards and faculties of the county. In several Wisconsin communities attempts have been made to take into account the mutual relations of country schools and high schools, and the methods employed are described in some detail.

A demand for schools reflecting the daily life and interests of the agricultural community found a response in special schools of agriculture and home economics, established in Wisconsin by individual counties within the last 15 years. The agricultural instruction given in the Wisconsin high schools, including home and school project work, boys' and girls' clubs, extension work, community fairs, and live-stock judging, together with the equipment needed, is briefly described. Such vocational training has been found of great practical value in the improvement of agricultural practices and home life in the community.

Vocational training in agriculture (*Agr. Gaz. Canada, 5 (1918), No. 3, pp. 289-292*).—In this article the means adopted in the United States for the promotion of vocational training in agriculture are compared with the objects aimed at by the Agricultural Instruction Act in Canada, which is intended to assist in the field covered by the Smith-Lever and the Smith-Hughes Acts in this country. It is found that while there is a marked similarity of purpose between the United States and the Canadian acts, the application of funds is more restricted in the former than in the latter case. The Agricultural Instruction Act contains no limitations with reference to the application of funds to the purchase, erection, preservation, or repair of buildings or equipment, to the purchase or rental of lands, or to the support of any religious or privately owned school or college.

Lessons on pork production for elementary rural schools, E. A. MILLER (*U. S. Dept. Agr. Bul. 646 (1918), pp. 26, figs. 15*).—Attention is called to the importance and educational value of pork production, and nine lessons, including practical exercises, references to literature, and suggestive correlations, are

outlined on the following topics: Types and breeds, houses, swine judging, fattening meat hogs, selecting breeding stock, dressing and curing meat, sow and pig management, forage crops, and sanitation and diseases.

Lessons on corn for rural elementary schools, C. H. LANE (*U. S. Dept. Agr. Bul.* 653 (1918), pp. 19, figs. 7).—A revision of Farmers' Bulletin 617 (E. S. R., 32, p. 197), including additional material on the adaptation of the lessons to the needs of the community, the use of illustrative material, and correlating the work with other school subjects.

Country life readers, third book, CORA W. STEWART (*Richmond, Va.: B. F. Johnson Publishing Co., 1917, pp. [2]+285, figs. 41*).—This is the third book of the series of three country life readers by the founder of moonlight schools. It includes writings dealing with the forest, birds, insects, the grass family, important farm plants, including corn, cotton, hemp, alfalfa, potato, the bean field, and the pumpkin, flowers, fruits, animals, the farmer and the farmer's wife, civics, and the Scripture. The purposes of the book are to point out the beauties of country life and to lead the readers to the best authors who write of country life. The series is designed for use in evening rural schools for adults or moonlight schools.

Some mechanical aids in nature study, W. G. VINAL (*Nature-Study Rev.*, 14 (1918), No. 2, pp. 60-73).—The author briefly describes some general and specific aids in teaching nature study.

Home economics.—State course of study for elementary and secondary schools of Indiana, BERTHA LATTA (*Ind. State Dept. Pub. Instr. Bul.* 29 (1917), pp. 44).—This bulletin contains outlines of courses of study in home economics for (1) the seventh and eighth grades of rural schools, to give the pupils a general view of the field of home economics rather than a detailed study of any line, (2) the seventh and eighth grades of city schools to give the pupils a general view of the field of home economics through a detailed study of continuous courses, and (3) the high school, including one year of work each in foods and cookery, clothing and textiles, and home management.

Lists of individual and group equipment and references to helpful literature are included.

MISCELLANEOUS.

Report of the John Jacob Astor Branch Experiment Station, 1914-15, H. A. LINDGREN (*Oregon Sta., Rpt. John Jacob Astor Sta., 1914-15, pp. 6, figs. 3*).—An account is given of the establishment of this substation in 1913 and its development up to January 4, 1915.

Report of the Southern Oregon Branch Experiment Station, 1914-15, F. C. REIMER (*Oregon Sta., Rpt. South. Ore. Sta., 1914-15, pp. 11, fig. 1*).—An account is given of the work in progress at this substation.

Monthly Bulletin of the Ohio Agricultural Experiment Station (*Mo. Bul. Ohio Sta.*, 3 (1918), Nos. 4, pp. 101-136, figs. 9; 5, pp. 139-167, figs. 14).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 4.—Work for Belmont County Experiment Farm, by C. W. Montgomery.

No. 5.—The More Common Lice of Poultry, by D. C. Mote, an extract from Bulletin 320 (E. S. R., 39, p. 85), and Potato Diseases, by D. C. Babcock, an adaptation from Bulletin 319 (E. S. R., 39, p. 53).

NOTES.

Arkansas University and Station.—H. A. Sandhouse, instructor in animal husbandry and assistant animal husbandman, has resigned to engage in war work and has been succeeded by Earl C. Thurber, of the Kansas College.

Delaware Station.—Dr. Don C. Dyer, chemist, and Dr. R. D. Mullinix, associate chemist, have resigned, the former to accept a commercial position and the latter to become associate professor of chemistry in the University of Florida. R. W. Goss, plant pathologist, has been inducted into military service and will be attached to the Medical Department.

Purdue University and Station.—Chas. Downing, for many years secretary of the State board of agriculture and a member of the board of trustees of the university, died July 27. G. A. Branaman has been appointed assistant in animal husbandry.

Nebraska University.—Dr. Samuel Avery, who has been on leave of absence as chancellor for several months in war service, has been commissioned major in the Chemical Warfare Service of the Army and has been placed in charge of the section on university relations.

Cornell University.—Dean Albert R. Mann has succeeded President J. G. Schurman as a member of the State food commission. Daniel P. Witter, who has been actively identified with farmers' institutes in the State for about 20 years, has been appointed to the staff of the extension department as advisor in institute extension. John H. Voorhees has been appointed to the extension staff in the department of field crops.

North Carolina Station.—According to a note in *Science*, Dr. R. O. Cromwell, assistant plant pathologist, has been appointed extension plant pathologist at the Iowa College.

Ohio State University.—Benjamin L. Thompson, associate professor of animal husbandry at the South Dakota College, has been appointed specialist of animal husbandry in the agricultural extension service.

Oklahoma College and Station.—The resignations on August 1 are noted of J. S. Malone as head of the department of animal husbandry, Dr. E. A. Benbrook as assistant veterinarian, and Dr. L. Chas. Raiford as professor of chemistry, the two last named having accepted positions at the Iowa College. Dr. John E. Guberlet on July 1 succeeded C. C. Knoblock, resigned as assistant parasitologist. W. E. White has been appointed assistant professor of horticulture, vice Miss Anna Cohen. Carl P. Thompson, of the Kansas College, has been appointed assistant in animal husbandry, beginning August 1, in charge of dairy cattle and hogs.

Pennsylvania Institute of Animal Nutrition.—Owing to the depletion of the institute staff by the demands of the war and the difficulty of securing a sufficient number of competent assistants with the funds available, it is anticipated that the investigations with the respiration calorimeter which have been in progress since 1902, with the cooperation of the U. S. Department of Agriculture, will have to be discontinued for the present. The investigations since 1915 have been upon the metabolism of dairy cows, with the cooperation of the Dairy Division of the Department, and it is hoped that it may be possible to continue such phases of the work as do not require the use of the calorimeter.

EXPERIMENT STATION RECORD.

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No. 4.

For many years the *Record* has been publishing a summary of the various acts making appropriations for the support of the Federal Department of Agriculture. These acts, prescribing somewhat definitely the Department's activities for the ensuing fiscal year and providing for the financing of these activities, have served as a convenient indicator of its progress as well as a forecast of its program for the months to come. More than this, as has been frequently stated, the acts have seldom been mere routine measures, but have usually embodied more or less general legislation on agricultural matters. Thus they have constituted concrete expressions of current public opinion as to some of the most pressing problems of American agriculture and the ways in which an institution like the Department can most effectively aid in their solution.

It has seemed desirable to summarize the latest of these appropriation acts in much the same way as in former years, although in several respects the conditions are not wholly comparable. The last general appropriation act to be discussed was enacted March 4, 1917, preceding by a few weeks the declaration of the existence of a state of war with Germany. The abnormal conditions following led to a redirection of many of the Department's activities with a view to the solution of problems of immediate importance having a direct bearing on the emergency. To enable the Department to deal more effectively with the war conditions, what is known as the Food Production Act was approved August 10, 1917. This measure carried an additional appropriation of \$11,346,400 to supplement the regular appropriations for the remainder of the fiscal year.

In submitting estimates for the ensuing fiscal year, that ending June 30, 1919, the policy of embodying the appropriations in two acts, the regular and the emergency, was continued. The regular act was framed primarily to deal with what may be termed the normal activities of the Department without special reference to war conditions. Subsequently an emergency agricultural appropriation bill was prepared along the general lines of the Food Production Act.

For various reasons neither of these measures was enacted by the close of the fiscal year. The regular act, passed by the House of Representatives February 1, 1918, and by the Senate March 21, was finally agreed upon by Congress but was vetoed by the President July 12 because of a provision embodied in it increasing the uniform minimum price guaranteed for the wheat crop of 1918. It was reintroduced September 21 in identical form except for the elimination of this amendment and became law on October 1. The emergency act, carrying supplementary appropriations aggregating over \$11,000,000 and extending additional appropriations of \$6,500,000 for the purchase and sale of seed as a revolving fund, was passed by the House May 23 and by the Senate with extensive amendments September 23, but had not become law at the time of writing.

The three months' interval between the ending of the previous fiscal year and the passage of the regular appropriation act was provided for by the adoption of special joint resolutions continuing with some restrictions the appropriations of the previous year. The emergency appropriations of the Food Production Act were being similarly continued for the month of October.

Comparison of the new appropriations with those of former years is further complicated by the fact that increasingly large sums of money are now available to the Department through other channels than the annual agricultural appropriation acts. Thus, what are known as the permanent appropriations of the Department, which a few years ago were comparatively minor sources of income, will aggregate for the present fiscal year \$22,735,000. The largest items are the Federal Aid Road Act carrying \$16,000,000, the meat inspection provision of \$3,000,000, and the Agricultural Extension Act with \$2,580,000.

Some annual allotments for the Department are also carried in other appropriation acts. One of these provides \$650,000 for its printing and binding. Another makes an indefinite appropriation increasing for the year the salaries of most of the employees of the Department, in common with those of other branches of the Government, who receive under \$2,620 per annum. This latter provision authorizes a flat increase of \$10 per month, under certain conditions, for employees receiving \$2,500 per year or less and is in lieu of a percentage increase of 5, or in some cases 10, per cent made the previous year to employees receiving \$1,800 and under. The aggregate funds from these various sources can not be definitely stated, but, including the emergency appropriations on the present basis, will exceed \$35,000,000. The appropriations carried by the regular act, amounting to \$27,875,353, thus will probably constitute less than half of the funds available for the Department.

As compared with the corresponding act for the previous year, there is an increase in the act itself of \$1,946,240, or nearly 7 per cent. While this increase is not so large as in many years, it is perhaps quite significant in view of the provision for emergency items in other ways. A number of allotments are materially increased, and opportunity is given for enlarged development in several important directions.

The most striking increases are in the funds available for the combating of pests and diseases of animals and plants. Not only are the previous large appropriations continued for the campaigns against foot-and-mouth disease, hog cholera, citrus canker, white-pine blister rust, the gipsy and brown-tail moths, and coyotes, prairie dogs and other injurious mammals, but special provision is made to enlarge greatly the work against tuberculosis, the cattle tick, the pink bollworm of cotton, and the black rust and stripe rust of cereals. The desirability of curtailing the enormous economic losses inflicted on production by these pests was apparently more keenly recognized by Congress than ever before.

For tuberculosis a definite allotment is granted of \$500,000, as compared with an expenditure of approximately \$132,618 for the previous year. Provision is made for both experimental and demonstration work, and for the reimbursement of owners of tuberculous stock under a cooperative arrangement with the State, county, or municipality. The Federal payment will in no case, however, exceed that from these other sources or be more than \$25 per head for grade or \$50 for pure-bred animals. The quarantine laws and regulations as to the movement of tuberculous stock are also modified in some particulars.

The fund for tick eradication is increased from \$631,560 to \$750,000. Greater progress in this work is reported for 1917 than for any previous year, about 67,000 square miles of territory having been released from quarantine, freeing the entire State of Mississippi and reaching the Gulf of Mexico for the first time. The subappropriation of \$50,000 for live stock and dairy demonstration work in cooperation with the States Relations Service is continued, and its restriction to areas freed of ticks is removed to permit work below as well as above the quarantine line.

The appearance in several localities in Texas of the pink bollworm of cotton has led to elaborate measures to prevent the establishment of this much feared pest. The appropriation of \$50,000 provided for the fiscal year 1918 was subsequently supplemented by a deficiency appropriation of \$250,000, and in the new act \$500,000 is granted. Of this amount \$400,000 is to locate possible infestations and attempt

their eradication, in cooperation with the Mexican authorities and with any adjoining States of this country, through the establishment of cotton-free zones and similar control measures. There is also allotted \$50,000 for the enforcement of the quarantine against the importation of cotton and cotton seed from Mexico, \$25,000 for a survey in that country to discover and eradicate local infestations near the border, and \$25,000 for technical investigations as a basis for control measures. Under this last item the establishment of a field station is contemplated in the Laguna district of Mexico, where the use of a tract of about 1,200 acres of land has been offered by local planters.

As regards cereal diseases, the previous allotment of \$20,000 for the study of black rust and stripe rust of wheat, oats, and barley is increased to \$100,000, with \$150,000 additional for the destruction of the common barberry and other vegetation on which the aecidial stage of the black rust is passed. There is also a new allotment of \$25,000 to combat corn root and stalk diseases.

Another new item in the act is a grant of \$250,000 for studies of dried or dehydrated foods. With the approval of the President this appropriation may be used in whole or in part for establishing and operating plants for dehydrating vegetables, fruits, and other edible products for the purpose of supplying the Army and Navy, and any receipts therefrom may be used during the year as a revolving fund.

The installation of an experimental flour mill, with baking and other apparatus, is also authorized at a cost of \$50,000. Studies of the milling and baking qualities of wheat and other grains are contemplated under the Bureau of Markets in connection with its grain standardization work.

As usual, several items of general legislation are embodied in the act. One of these extends the sale of nitrate of soda by the United States, authorized in the Food Control Act of 1917, to the duration of the war, and converts the receipts from previous and future sales into a revolving fund for the purpose. Another section amends the Oleomargarin Act of 1886 by permitting the use of paper packages in handling this product.

Taking up the allotments of the various bureaus and offices in turn, the Weather Bureau receives an apparent increase of \$129,790 and a total of \$1,912,930. A portion of this is provided for increased administrative expenses, but \$100,000 is in reality a transfer to this act of an item included in the Army Appropriation Act of 1918 for the establishment and maintenance by the Secretary of Agriculture of aerological stations for observations of atmospheric phenomena in aid of aeronautics. It is proposed to operate about five additional

stations for the immediate benefit of the aviation service of the Army. The bureau is also given \$10,000 to initiate studies of volcanology with a view to the forecasting of eruptions, this work for the present to be confined mainly to the volcanic region of Hawaii. On the other hand there is a decrease from \$10,000 to \$5,000 in the allotment requested for studies of orchard protection against frost, the curtailment contemplated resulting from the condition of the fuel oil supply and the economic difficulties of using it.

Some of the largest increases in the act are accorded the Bureau of Animal Industry, which receives as a direct allotment \$4,079,588. As already stated, this is supplemented by the permanent appropriation of \$3,000,000 per annum for meat inspection. In addition the usual emergency appropriation of \$1,000,000 plus any unexpended balance remaining from the fiscal year 1916 is again continued to combat outbreaks of foot-and-mouth disease, rinderpest, and other contagious and infectious diseases of animals, as are also the special appropriations of \$60,000 for experiments and demonstrations with live-stock production in sugar cane and cotton districts, and \$40,000 for experiments in dairying and live-stock production in semiarid and irrigated districts.

The principal item of increase for the bureau is that dealing with tuberculosis already mentioned, but there is also a net increase of \$63,140 for animal husbandry investigations, for which \$308,680 is available. This will offset increased expenses in continuing the military horse breeding work, and provide for an extension of the poultry and pig club operations and the studies and demonstrations in farm sheep raising.

The appropriations for the Bureau of Plant Industry aggregate \$3,137,038, substantially as for the previous year, although there have been some changes as regards individual items. The largest increases are for the combating of plant diseases as already noted. The pomological investigations have been divided, those features which have to do more directly with marketing being transferred to the Bureau of Markets, while the remaining studies of fruit ripening and storage changes are retained in cooperation with that bureau. There is an increase from \$82,510 to \$107,510 in the allotment for acclimatization and adaptation studies of cotton, corn, and other crops introduced from tropical regions, and the improvement of cotton and other fiber plants. Of this amount \$3,000 may be used for experiments in the production of New Zealand flax in the United States and its utilization in the manufacture of binder twine.

The shortage in the country's seed supply is reflected in net increases of \$10,000, to be used in extending the cooperative work of the Department in the production of sugar beet seed, and \$3,000 to enlarge its facilities for testing commercial seeds. The foreign seed

and plant introduction projects and the Congressional seed distribution are continued on the usual basis, the former receiving \$234,620 and the latter, \$242,320.

The appropriations for the Forest Service aggregate \$5,731,555, with \$100,000 additional for cooperation with the States in fire protection under the Appalachian Forest Reserve Act. The bulk of the appropriation is to be used in the administration, protection, and development of the National forests, which it is of interest to note returned in receipts for the fiscal year 1917 \$3,457,028.41.

Several readjustments are made in the Forest Service allotments in consequence of the war conditions. Curtailments are made of \$10,000 in the funds available for the survey and platting of lands on the National forests chiefly valuable for agriculture and of \$20,000 in the tree planting work. On the other hand \$20,000 additional is granted for the studies of the utilization of forest products, making a total of \$173,260 for this purpose. This increase is to be used for special work on war problems, notably the determination of woods most suitable for aircraft construction. The appropriation for the reconnaissance of forest resources is also increased from \$70,000 to \$100,000. For the duration of the war the Secretary of Agriculture is authorized to permit the use of the necessary timber from the National forests by the War Department or other Government agencies and the disposal of any surplus materials manufactured therefrom.

The appropriation for the Bureau of Chemistry is \$1,243,391, of which \$589,081 is allotted for the enforcement of the Food and Drugs Act. Authority is given for the detail of medical officers from the Public Health Service to assist in the administration of this act.

A new item is \$25,000 for studies of insecticides and fungicides. In view of the scarcity of some ingredients now in use it is hoped to develop new methods of manufacture whereby greater economy may be attained and additional sources of raw material may be utilized. Chemical studies are also contemplated as to the methods of application and action of insecticides and fungicides.

There is likewise a net increase of \$25,000 for dyestuffs investigations, making \$70,720 for this purpose. An experimental laboratory for this work has been constructed, and it is announced that a number of promising processes for the manufacture of dyes have been under test. Authority is added to permit cooperation with corporations and others in the development of this work.

The Bureau of Soils is granted \$491,235, of which \$198,200 is for the continuation of the soil survey and \$127,600 for the studies of the extraction of potash salts from kelp. An experimental plant has been

erected at Summerland, Cal., for this latter purpose, from which it is expected to derive valuable data as to the commercial feasibility of the process. The remainder of the bureau's appropriation is divided among the usual soils projects, including an allotment of \$31,340 to continue the survey of fertilizer resources.

There is an increase of \$55,200 for the Bureau of Entomology, making its total \$986,680. This is in addition to the \$500,000 appropriation already discussed for the combating of the pink bollworm of cotton, which is dealt with by the Federal Horticultural Board, and to a new grant of \$20,000 for the control of the sweet-potato weevil. The largest single item of increase for the bureau is \$23,000 for insects affecting stored products. This project has, of course, attained unusual importance as a conservation measure. It is hoped to extend the studies materially, dealing particularly with the insects affecting food supplies and other stored products in granaries, mills, warehouses, households, and the like, and developing methods of control.

The remaining projects of the bureau are continued without material change, the largest being as usual that for the gipsy and brown-tail moth control, for which \$304,050 is appropriated. There is an increase of \$15,000 for bee keeping demonstration work, \$10,000 additional for studies of insects attacking deciduous fruits, orchards, vineyards, and nuts, and \$6,000 to aid in extension work in insect control in cooperation with the States Relations Service.

The total appropriation for the States Relations Service is increased from \$3,107,660 to \$3,150,820. A portion of this increase is in consequence of the enlarged administrative activities of the service, corresponding to the increase of the funds carried in the Extension Act from \$2,080,000 to \$2,580,000. The greater portion, however, consists of \$5,000 additional for each of the four insular experiment stations, and \$15,000 for the development of experimental work in the Virgin Islands along the lines previously noted (E. S. R., 38, p. 608). It is hoped that these increases will help to develop the extension work in Alaska, Hawaii, and Guam, further equip some of the stations in Alaska, continue studies of rice production in Porto Rico, and enable additional work with plant diseases and insect pests, notably coffee and banana diseases in Hawaii and citrus scab in Porto Rico.

No change is made in the funds available for the farmers' co-operative demonstration work. The allotment for the States within the cotton belt is \$650,140, and for the remainder of the country, \$554,800. The usual allotments are made of \$20,600 for the work with farmers' institutes and agricultural schools, and \$30,120 for the Office of Home Economics.

The appropriation for the States Relations Service includes as usual \$1,440,000 for payment to the States under the Hatch and Adams Acts. An amendment is added authorizing the Secretary of Agriculture to continue these payments to the Georgia Experiment Station, although as organized and conducted for many years this station is not connected with the State College of Agriculture and Mechanic Arts and hence is not strictly in accord with the terms of the Hatch Act. The amendment further states that this action is not to be construed as limiting the authority of the Secretary in his supervision of the operations of the station.

The Office of Public Roads and Rural Engineering is rechristened the Bureau of Public Roads. The various lines of engineering activities are continued, although a reduction of \$20,000 is made in the allotments for farm irrigation and drainage investigations, making \$82,440 and \$73,760, respectively, available for these purposes. The act makes no change in the remaining allotments of the bureau, the aggregate for which is \$593,540. This, of course, is exclusive of the \$450,000 allowed in the Federal Aid Road Act for administrative expenses under that act.

The total appropriation of the Bureau of Markets is increased from \$1,718,575 to \$2,023,255. This includes several items already explained, and an allotment of \$113,000 which replaces a provision in the Food Production Act authorizing the Secretary of Agriculture to certify to shippers and others the condition of perishable farm products when received at important central markets. There is also a net increase of \$50,000 to enlarge the market news service for fruits and vegetables and one of \$10,000 to extend the corresponding reports on live stock and meats. For additional studies of live stock, meats, and animal by-products, a net increase of \$12,580 is provided, and for further cooperation with the States in marketing work, one of \$32,000. It is announced that this cooperation is now under way in 21 States and that arrangements are in course of completion with seven others. The usual provision is made for the administration of the U. S. Grain Standards, Warehouse, and Standard Containers acts, and an increase of \$25,000 is provided for the enforcement of the U. S. Cotton Futures Act.

The work of the remaining branches of the Department is continued on substantially the present basis, both as to funds and as to lines of work. The Bureau of Crop Estimates receives \$346,232, an increase of \$22,780, this being chiefly for additional administrative expenses. The Bureau of Biological Survey is granted \$586,350; the Office of the Secretary, \$767,090, of which \$305,090 is for the Office of Farm Management; the Division of Accounts and Dis-

bursements, \$44,920; the Division of Publications, the editorial work of which has been transferred to the Office of the Secretary, \$214,740; and the Library, \$50,160. For the enforcement of the Insecticide Act the Department is granted \$121,240, an increase of \$8,740; \$74,800 for the enforcement of the Plant Quarantine Act by the Federal Horticultural Board; \$48,600 for demonstration work on reclamation projects; \$158,689 for rent of buildings in the District of Columbia; and \$142,500 for miscellaneous expenses.

Thus it may be seen that while a study of the regular appropriation act will not suffice this year for a comprehensive survey of the Department's entire program and resources, none the less it supplies much interesting information. Most significant perhaps is the indication afforded of the importance attached by Congress to the everyday, normal activities of the Department, and the belief that, irrespective of the vast emergency program and the unparalleled strain on the country's resources, the Department's routine organization and work must be financed and continued as essential to the national interest.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Factors involved in the ripening of fruits, R. E. NEIDIG, C. W. COLVER, H. P. FISHBURN, and C. L. VON ENDE (*Idaho Sta. Bul. 104* (1918), pp. 22-25).—A study is reported of the relationship between the physical and chemical characteristics of the apple and of the carbohydrate changes during growth, ripening, and storage. A close relationship was found to exist between the curve for the physical constants (osmotic pressure, refractive index, and electrical conductivity) and the curves for sugar and total solids. The refractive index is considered to be an important physical constant for measuring the carbohydrate change. The conductivity was found to be proportional to the potassium content of the cell and to be affected by desiccation and respiration.

Determinations of starch, sucrose, and invert and total sugar at different periods showed that during growth there is a rapid increase of invert sugar and of starch. During ripening the starch decreases and the sugar rapidly increases. During after-ripening and storage there is at first a slight increase in invert sugar followed by a continual decrease. There is also a decrease in sucrose. No marked chemical differentiation could be noticed between cellar and cold storage.

Preliminary work on the enzymes of the apple gave no conclusive evidence of the presence of diastase or invertase. Esterase was found, and oxidase was present in green apples.

The acids of silage, R. E. NEIDIG, C. W. COLVER, H. P. FISHBURN, and C. L. VON ENDE (*Idaho Sta. Bul. 104* (1918), pp. 19, 20).—A determination of the kinds and quantity of acids in different silage mixtures showed that several crops develop an acid fermentation in the silo that is very similar to that developed in normal corn silage, lactic, acetic, and propionic acids being formed. Crops showing a typical acid fermentation were peas, oats, and mixtures of peas and oats in varying proportions. Clover and clover and wheat-straw mixtures developed a good acid fermentation. The clover straw silage was, however, more keenly relished by dairy stock than was the straight clover silage. It is suggested that in sections where clover is cured with difficulty for hay, the feeder of live stock may find it feasible and profitable to combine the crop with a liberal proportion of straw. Neither alfalfa alone nor in combination with straw developed a typical acid fermentation. The silage contained considerable butyric acid, but only traces of lactic acid, and was considered unfit for feeding purposes.

The calcium arsenates, R. H. ROBINSON (*Jour. Agr. Research* [U. S.], 18 (1918), No. 5, pp. 281-294).—The author reports investigations, made at the Oregon Experiment Station, on the preparation and physical and chemical properties of calcium hydrogen arsenate (CaHAsO_4) and tricalcium arsenate [$\text{Ca}_3(\text{AsO}_4)_2$] with a view to establishing their value as spray materials. Methods of preparing both salts in a pure form are described and the following data of their properties given: Calcium hydrogen arsenate—specific gravity 3.48, solubility at 25° C. 0.31 gm. in 100 gm. of water; tricalcium arsenate—specific

gravity 3.31, solubility 0.013 gm. in 100 gm. of water. The hydrogen arsenate was much less stable than the tricalcium arsenate. The data indicate the futility of attempting to use acid calcium arsenate alone as a spray on account of its instability and tendency to form soluble arsenic and cause burning of the foliage. Chemical tests of the relative stability of the separate salts and of combinations with other substances showed that (1) the addition of excess of calcium oxid to either of the calcium arsenates prevents arsenic from going into solution, (2) carbonic acid has a solvent action on the calcium arsenates which is diminished in the presence of calcium hydroxid, (3) there is no apparent reaction between either of the arsenates and lime-sulphur when combined at a dilution used for field spraying, and (4) commercial "soluble sulphur" has a solvent action on the arsenates.

The composition of various samples of commercial calcium arsenate is reported. The pure salts contain 57.8 and 63.9 per cent of arsenic calculated as the pentoxid for the tricalcium arsenate and calcium hydrogen arsenate, respectively, or relatively twice as much arsenic as is contained in the lead arsenates.

The author states that thus far the investigation has shown that the calcium arsenates should be considered as "a practical, economical, and evidently satisfactory substitute for the more expensive lead arsenate."

The calcium arsenates, R. H. ROBINSON (*Oregon Sta. Bul. 131 (1918), pp. 3-15*).—This has been essentially noted above.

The author recommends equal parts of the commercial calcium arsenate and quicklime (1.5 lbs. of each to 50 gal. of water) as the most efficient proportions for trial experiments. The quicklime should first be slaked in a small amount of water, then added to the spray tank containing the 50 gal. of water and stirred occasionally for an hour before being used. The calcium arsenate should be added immediately before spraying.

Owing to the limited number of field experiments with calcium arsenate which have been reported, he advises that spraying with it should be done in an experimental way until absolute safety in its use is assured. It is estimated that, if practicable, the use of calcium arsenate in the place of lead arsenate would result in an annual saving in the United States of more than \$1,800,000.

Technical applications of nephelometry, P. A. KOBER (*Jour. Soc. Chem. Indus., 37 (1918), No. 5, pp. 75T, 76T, fig. 1*).—The principle of the nephelometer (E. S. R., 37, p. 205) is explained and its application in the determination of ammonia, phosphorus, calcium, acetone, fats and oils, and proteins described.

Technical applications of nephelometry, P. A. KOBER (*Jour. Indus. and Engin. Chem., 10 (1918), No. 7, pp. 556-563, figs. 11*).—This is a more detailed discussion of the subject noted above. Illustrations of the nephelometer and colorimeter and diagrams of nephelometric curves are included.

A study of the nephelometric values of cholesterol and the higher fatty acids, F. A. CSONKA (*Jour. Biol. Chem., 34 (1918), No. 3, pp. 577-582*).—The author has investigated the nephelometric method for the determination of fat in regard to certain theoretical points which may influence the accuracy of results. The problems considered in this paper are the influence upon the nephelometric values of the fatty acids of the concentration of the acid used to liberate the fatty acids and develop the turbidity; the relative nephelometric values of oleic, palmitic, and stearic acids, and of cholesterol; and the time of reaction with each substance. Fatty acids in high alcoholic solution were used as stock solutions. Precipitation of palmitic and stearic acids was prevented by neutralizing the solution with sodium hydroxid. Hydrochloric acid was used to develop turbidity, and the latest model Kober nephelometer was used in comparing the different suspensions.

Considering the nephelometric value to be "the turbidity produced by a given amount of a substance compared in the nephelometer to a given standard within a given length of time," it was found that "the nephelometric value is influenced by the acid concentration of the suspension. The optimum acid concentration is that which produces the highest nephelometric value with the least change within specified intervals of time. This change does not take place with the same rapidity and to the same degree in each case. The nephelometric values of cholesterol, stearic acid, palmitic acid, and oleic acid are different."

Preparation of organic material for the determination of phosphoric acid and potash in aliquots of the same solution, R. M. WEST (*Jour. Assoc. Off. Agr. Chem.*, 3 (1917), No. 1, pp. 99-101; *abs. in Minnesota Sta. Rpt. 1917*, p. 34).—The following modification of the official methods of preparation of organic material for the determination of phosphoric acid and potash was devised with a view to the saving of time in the estimation of both when occurring in the same material:

Five gm. of a finely ground sample is weighed and transferred to a Kjeldahl digestion flask (Jena glass), 30 cc. of nitric acid (sp. gr. 1.42) added, a small funnel placed in the mouth of the flask to serve as a condenser, and the mixture heated on a steam bath for about an hour. Ten cc. of hydrochloric acid (sp. gr. 1.2) is then added and the digestion on the steam bath continued overnight. The following day, 20 cc. of sulphuric acid (sp. gr. 1.84) is added, and the contents of the flask are boiled over a free flame. The flame should be so adjusted that when digestion is complete the volume of acid will be reduced to about 5 cc. The digestion is carried on in the same manner as a nitrogen digestion. The solution is then allowed to cool, transferred to a 250 cc. volumetric flask, made up to volume, and aliquot portions are pipetted off for the determinations of potash and phosphoric acid according to the official methods of the association.

Fairly concordant results are obtained by this and the official methods, showing that the sulphuric acid digestion of organic matter does not interfere with the subsequent phosphoric acid determination, and that the use of Jena glassware for wet ignition of plant material with sulphuric acid does not affect the subsequent determination of potash.

An accurate loss-on-ignition method for the determination of organic matter in soils, J. B. RATHER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 439-442, figs. 3).—This is an abstract by the author of Arkansas Station Bulletin 140, previously noted (*E. S. R.*, 39, p. 11), with additional material on the application of the method to abnormal soils. With soils containing a large amount of acid-soluble organic matter, it becomes necessary to modify the method so as to recover the acid-soluble material without including hydrated or easily decomposed organic matter. The modification consists of extracting the sample with 2 per cent ammonium carbonate solution instead of with water, two digestions being sufficient with mineral soils. The original method is then followed, except that the ammonium carbonate extract is evaporated completely to dryness before combining with the residue from the acid digestion.

A technique for the bacteriological examination of soils, H. A. NOYES and E. VOIGT (*Proc. Ind. Acad. Sci.*, 1916, pp. 272-301, figs. 9).—The procedures followed in preparing the apparatus, in mixing the soil samples, in making the bacterial dilutions, and in plating are given in detail.

Fifty gm. of fresh soil is recommended as the standard amount of soil to be used with 200 cc. of sterile water as the basis of all dilutions. Dilutions are made of the bacteria and not of the soil, each higher bacterial dilution being made by taking 10 cc. of the lower dilution and 90 cc. of sterile water. Bac-

terial dilutions should be shaken long enough so that variations in carrying out the technique of shaking will be eliminated. A .1 cc. aliquot of the proper dilution is used for plating and is added direct to the Petri dish before the addition of the media.

The reasons for each step of the procedure are discussed in full, and analytical data are given in support of the conclusions drawn.

New method for drying ether and sample in the determination of ether extract. R. M. WEST (*Jour. Assoc. Off. Agr. Chem.*, 3 (1917), No. 1, pp. 101-103; *abs. in Minnesota Sta. Rpt. 1917*, p. 34).—The method involves mixing the ground sample with calcium carbide, which serves as a drying agent for both the sample and the ether. The details of the method are as follows:

Put about 2 gm. of finely ground calcium carbide in the bottom of an extraction thimble, add the weighed sample (usually about 2 gm.), and then 5 or 6 gm. more of the carbide. Mix with a spatula and extract with ordinary ether in a Soxhlet extractor, completing the determination as prescribed by the official method.

A comparison of the results obtained by this method with those by the official method and those obtained with ordinary ether and air-dry sample shows that the results by the first two methods agree fairly closely, while with moist ether and air-dry sample they are generally materially higher.

The method is considered to be applicable to fat determinations in semifluids, animal tissues, and other substances which are dried with difficulty.

Sudan III and the detection of fat. V. H. MOTTEAM (*Jour. Physiol.*, 52 (1918), No. 1, pp. XVIII, XIX).—Sudan III is used for the detection of fat in a physiological mixture as follows:

One gm. of the powdered solid is shaken for a minute with 10 cc. of a saturated solution of Sudan III in 70 per cent alcohol. The liquid is filtered through a small fat-free filter paper and the color of the filtrate compared with that of the control prepared by shaking 1 gm. of a fat-free powder (such as starch or casein) with Sudan III solution and treating as above.

In applying the test to milk, the curd is precipitated with acetic acid, filtered on a small filter paper, and washed with dilute acetic acid. The filter paper and contents are transferred to a test tube, shaken with 10 cc. of Sudan III solution, filtered, and the filtrate compared with the control in which is used the same amount of caseinogen as would be found in the milk taken. The delicacy of the test is shown by a table of results with milk at different dilutions.

Chemical tests for the detection of rancidity. R. H. KERR (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 471-475; *abs. in Chem. Abs.*, 12 (1918), No. 13, p. 1423).—Critical studies are reported of the phloroglucin-hydrochloric acid color reaction of Kreis and of the oxidation value of Issoglio (*E. S. R.*, 37, p. 114) for the detection of rancidity in fats. Conclusions drawn from the use of the Kreis test on many samples of known and unknown character are as follows:

"All rancid fats react to the Kreis test. The intensity of the reaction is roughly, but not exactly, proportional to the degree of rancidity. Fresh, sweet fats do not give the reaction except in certain special cases. Such a case is that of crude cottonseed oil, which reacts with great intensity. In this case the substance which causes the reaction is removed by refining with caustic soda. The Kreis test is too delicate to be used alone as a criterion of rancidity. If all fats which react were to be pronounced rancid many samples which are not rancid in any sense would have to be condemned as rancid. The Kreis test is not specific for rancid fats. It is given by aldehydes and ketones, other than

those which occur in rancid fats, by most of the essential oils, by crude cotton-seed oil, and probably by other crude oils."

The use of the Kreis test is chiefly limited to the confirmation of suspicions of rancidity based on taste and odor and to reaching a decision in cases in which the odor and taste of rancidity are masked by other odors and tastes. In applying the test, the intensity of the reaction can be judged by diluting the original fat with kerosene and noting the degree of dilution at which a reaction ceases to be observed.

Results with the oxidation value of Issoglio, determined by distillation, were compared with the corresponding values by extraction with distilled water. The extraction method was found to give slightly higher results, but was thought to follow the actual condition of the fat more closely and can be carried out more easily.

The method is considered by the author to yield less exact and definite information than is given by the Kreis test, but it has a certain value as a confirmatory test. A high oxidation value taken in connection with the usual physical signs of rancidity is to be regarded as positive evidence of rancidity. A low value can not, however, be held as conclusive evidence of the absence of rancidity, while a negative reaction to the Kreis test can be so regarded.

A new method for detecting and determining butyric acid, G. DENIGES (*Ann. Chim. Analyt.*, 23 (1918), No. 2, pp. 27-31; *abs. in Analyst*, 43 (1918), No. 505, p. 145).—The method described depends upon the principle of the oxidation of butyric acid to diacetic acid by the action of hydrogen peroxid in the presence of an iron salt as a catalyzer. The diacetic acid is then detected by Legal's nitroprusside reaction. As confirmatory tests, the Gerhardt reaction with perchlorid of iron and the precipitation reaction with mercuric sulphate may be used. The method is described in detail. It is said to be applicable to the detection of small amounts of butyric acid in complex mixtures.

The effect of alkali treatment on cocoas, E. BLOOMBERG (*U. S. Dept. Agr. Bul.* 666 (1918), pp. 20).—The investigation was undertaken primarily to determine whether the alkali treatment known as the Dutch process renders cocoa more soluble and what changes take place as a result of this treatment. Analyses of treated and untreated cocoas included determinations of total ash, water-soluble and water-insoluble ash, alkalinity of the soluble and insoluble ash, and protein.

The analytical data obtained showed that the greatest effect of the alkali treatment is apparently the increase in the color of the water solution. The alkali treatment causes a decrease in the ash-free soluble matter and a slight increase in the amount of water-soluble protein which is, however, more than balanced by a decrease in the solubility of the nonnitrogenous substances which are normally soluble in water. A portion of the water-soluble protein of the alkali-treated cocoas is rendered insoluble when the water solution is made 1 per cent acid with sulphuric acid. The alkali treatment increases the ratio of the soluble to the insoluble ash and of the alkalinity of the water-soluble ash to that of the water-insoluble ash.

The conclusions are drawn that the presence of an alkali-treated cocoa may be proved by the high color value of the water solution, by the presence of a water-soluble protein precipitable in 1 per cent sulphuric acid, and by the increase in the ash and alkalinity ratio. The claim that the alkali treatment increases the amount of cocoa soluble in water is considered to be without foundation.

Phosphorus as an indicator of the "vitamin" content of corn and wheat products, C. VOEGTLIN and C. N. MYERS (*Pub. Health Rpts.* [U. S.], 33 (1918), No. 23, pp. 911-917).—The authors have determined the phosphoric anhydrid

content of wheat and corn products for the purpose of comparison with the vitamin content as estimated from feeding experiments. Tabulated data are given showing that a low phosphoric anhydrid content indicates that the product is poor in vitamin.

In order to illustrate the distribution of phosphorus in the original grain in the course of roller milling, a brief outline and a diagram of the flour milling process are given.

A method for the colorimetric determination of lactose in milk, A. J. P. PACINI and DOROTHY W. RUSSELL (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 505-507).—The method is based on the Lewis-Benedict method for the determination of sugar in blood.¹ The technique to be used with breast milk is as follows:

The milk is diluted 1:100, and to 10 cc. of the dilution in a Purdy centrifuge tube 0.5 gm. of solid picric acid is added and dissolved by shaking. After standing 5 minutes the solution is centrifuged for 10 minutes and filtered through a small filter paper to remove the fat. Into separate test tubes are pipetted 1 cc. of the milk solution and 1 cc. of a standard made by dissolving in a saturated aqueous solution of picric acid 0.1 per cent of pure recrystallized lactose. To each tube is added 1 cc. of a saturated solution of sodium carbonate. The tubes are immersed in boiling water for 20 minutes, diluted when cool to 10 cc., and compared in the Duboscq colorimeter. The

amount of lactose is calculated from the following formula: $x = \frac{S}{R} \times \frac{m}{W} \times 0.1$

where x is the percentage of lactose in the milk, S the reading of the standard, R the reading of the unknown, m the milligrams of lactose to which the standard corresponds, and W the number of cubic centimeters of milk used. If cow's milk is to be tested a slightly weaker standard of lactose should be used.

The method is considered to be expeditious and accurate and very convenient for routine laboratory work.

Determination of nitrogen content of rubber, M. HOWIE (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 6, p. 85 T; *abs. in Analyst*, 43 (1918), No. 507, pp. 226, 227).—Experiments to determine whether in the Kjeldahl estimation of nitrogen in rubber it is necessary to continue the digestion until the mixture is colorless showed that it is not necessary to clear the solution and that from three to four hours is quite long enough to get the maximum nitrogen figure.

Sirup from sweet sorghum, W. V. CRAVENS (*California Sta. Circ.* 198 (1918), pp. 16, figs. 11).—This publication describes methods of making sirup from sweet sorghum, particularly such methods as are adapted for small scale operations. Estimates of the cost of equipment for sorghum sirup manufacture and of approximate returns from the sirup are included. An estimate of the latter, on the basis of California experience, gave a net profit per acre of \$99.40, allowing no interest on land or rent charges.

Among the suggested uses of sorghum sirup are as a table sirup and as a substitute for sugar in cooking, canning fruits, and jelly making.

A new and improved method for obtaining pectin from fruits and vegetables, C. A. MAGOON and J. S. CALDWELL (*Science, n. ser.*, 47 (1918), No. 1224, pp. 592-594).—Continuing studies on the isolation and purification of pectin, previously noted (*E. S. R.*, 37, p. 715), the authors describe a method available for use with any pectin-containing substance.

The pectin is extracted from the material by the usual method of pulping, boiling with water, and draining, the process being repeated until the pulp is exhausted. The combined water extracts are cooled, and a small quantity of

¹ *Jour. Biol. Chem.*, 20 (1915), No. 1, pp. 61-72.

a saturated solution of a commercial alum (the exact amount being determined by the viscosity of the liquid) is slowly added and thoroughly mixed with the solution. Ammonia is then added until no further precipitate is formed. The coagulation of the precipitate and clarification of the liquid are hastened by warming or diluting with hot water. The solution is then filtered and the residue saved for subsequent recovery of the aluminum. The clear filtrate is heated to boiling, and magnesium sulphate crystals are added, with constant stirring, until the pectin is no longer precipitated. The mixture is filtered, and the precipitated pectin is freed from magnesium sulphate by washing with cold water and then dried.

The pectin thus prepared is a grayish powder, insoluble in cold water but readily soluble in warm acid solutions. It is said to be entirely free from the coloring and flavoring matters of the material from which it was prepared and may consequently be employed in making jellies without danger of introducing foreign flavors. On account of its purity it may be kept for long periods in the dry condition without deterioration. A valuable feature of the process is that the chemicals employed may be almost completely recovered, thus reducing to a minimum the cost of the process. The authors point out the fact that magnesium sulphate (Epsom salts) may advantageously supplant the use of alcohol in the household test for pectin.

Cider- and vinegar-making qualities of Minnesota apples, W. G. BRIDLEY (*Minnesota Sta. Rpt. 1917, pp. 55-57*).—Analyses of samples of cider show that the sugar content of Minnesota apples is not high, necessitating careful work in the preparation and handling of the cider for vinegar making.

The results of variations in the fermentation procedure in different lots of cider led to the conclusion that cider capable of producing vinegar of standard strength will do so regardless of modifications in the fermentation procedure if kept at ordinary room temperature under the usual methods for cask fermentation. The fermentation studies show that most vinegars are brought up to a standard strength within five or six months. Holding weak vinegar in casks for a longer time does not insure greater strength, and has often resulted in peculiar changes and an actual loss of strength. Lists of varieties of apples suitable for cider and vinegar are presented.

[Analyses of vinegar samples], C. W. BROWN (*Michigan Sta. Rpt. 1917, pp. 272-274*).—Analyses of samples of vinegar from various parts of Michigan are reported, together with suggestions for improvement. The three chief causes of poor quality in some of the samples examined are considered to be (1) diseases, that is the growth of a group of bacteria in must favored by the use of unsound fruit, by extreme low acidity in the must, and by a tardy alcoholic fermentation; (2) the presence in the must of high acidity due to placing the fresh juice in casks containing a quantity of vinegar and to the growth of acetic bacteria before the yeast has begun active work; and (3) restraint of the supply of free oxygen due to filling the casks too full and to closing or nearly closing the bung.

Preservation of vegetables, roots, and tubers (*Bul. Dir. Gén. Agr., Com. et Colon., Tunis, 21 (1917), No. 92, pp. 189-209*).—This article describes methods of preservation by sterilization, by the use of antiseptics such as salt and vinegar, by drying, and by ensiling, as in the manufacture of sauerkraut. For the preservation of potatoes it is suggested that the eyes be mechanically removed or that the germs be destroyed by immersion in water containing 1.5 per cent acid.

Storing canned foods in the open can, W. D. BIGELOW (*Amer. Food Jour., 13 (1918), No. 2, pp. 80-82, fig. 1*).—To determine the effect of storing canned foods in the open can, determinations were made of acidity, tin, and iron in

various canned products which had been allowed to stand from one to three days in the open tin.

The results showed that with pineapples and, to a less extent, with apples the tin content increased perceptibly from the beginning of the study until the fruit began to ferment, after which there was a marked increase in the amount of tin dissolved. With pineapples this change occurred after two days' and with apples after one day's storage. In both cases the acidity remained constant until the fermentation was evident to taste and smell. With other foods there was no noticeable increase in the amount of tin or in the acidity as determined by titration until the decomposition of the food was evident to taste and smell. The amount of iron did not increase in any of the samples, with the possible exception of pumpkin in which there appeared to be a small increase in iron content. The odor, taste, and appearance of the samples remained normal until decomposition began and, hence, were the same as if stored in glass or porcelain.

Everywoman's canning book, MARY B. HUGHES (*Boston: Whitcomb & Barrows, 1918, pp. VIII+96, pt. 1, fig. 1*).—This is a manual of directions for the home canning of vegetables, meat, fish, and fruits. Many old New England recipes for pickling and preserving are included. Special attention is called to the necessity of correct processing in using the cold-pack method. It is suggested that the flavor of all canned products is greatly improved when the jar is opened six hours before serving.

METEOROLOGY.

Periodical events and natural law as guides to agricultural research and practice, A. D. HOPKINS (*U. S. Mo. Weather Rev. Sup. 9 (1918), pp. 42, pls. 2, figs. 22*).—"The object of this paper is to make available for agricultural research and practice certain information which has been gained from an extended investigation of the principles and laws which govern periodical events in the seasonal history of forest insects and the time for the most effective treatment to control or prevent their depredations. It is intended to show that there is in general a safest and best time for periodical farm and garden practice to guard against or control insect and other enemies and to secure the best returns from the expenditure of money and labor and, by means of maps and calendars and tables of periodical events in the seasonal activities of common plants, to show how the safest and best time for certain kinds of periodical practice can be approximately determined for any place in the country. A further object is to give examples of the application of our present knowledge of a bioclimatic law to research and practice."

It is held that the results of the more recent investigations and observations which are fully reviewed in this paper furnish "sufficient evidence to establish the bioclimatic law as a reliable guide and working basis." According to this law "there is a country-wide average rate of variation in the time of occurrence of regular periodical events in plants and animals between different geographical positions as defined by latitude, longitude, and altitude. This rate is 4 days for each, 1° of latitude, 5° of longitude, and 400 feet of altitude. . . . Isophanal lines drawn on a map in a northwestern course from the eastern border at the rate of 1° of latitude to 5° of longitude serve as a diagrammatic expression of the law as related to latitude and longitude of the land surface. . . .

"The isophane, together with any given level, serves as a bioclimatic constant by means of which the date of a phenological event, plus or minus departures for regional and local influences, can be computed for any place along

its course to correspond with that of a determined base. The phenological date constant thus computed serves also as a measure in time and distance of the rate of departure and the intensity of the influences which cause it. The departures of the actual from the computed constants serve as the most reliable basis for interpreting regional and local influences toward retarding or accelerating the date of events; also as a guide to the required plus or minus corrections of the computed to approximate more closely the actual dates.

"The county averages of over 40,000 reports, covering the entire wheat-growing area of the country and giving dates of general seeding and beginning of harvest of winter wheat, compared with the computed dates for the same counties, showed that in general there was but a slight difference between the reported and computed harvest dates (except in regions where there is a marked retarding or accelerating influence), thus presenting substantial evidence in support of the law as a reliable guide to the predetermination of dates of periodical events and bioclimatic conditions for any county or quadrangle unit.

"In general, for the whole country, the departures for spring and early summer events are plus the constant for valleys and coasts and minus for plains, plateaus, and mountains, and the reverse for late summer and autumn events. This relation of departures to depressions and elevations of land surface also holds for regions and minor areas down to those of a few acres or even a few rods in extent, so that it may be considered as a law of topographic influence on phenological phenomena. The constant character of the departures from the computed constant, all pointing in the same direction within a region, is most significant evidence of the existence and wide range of accelerating and retarding influences which must be associated with peculiar climatic variations from the average of the whole country. Thus, through a study of a single periodical event, a guide has been found to the comparative intensity of the influences in the various regions of the country which contribute to an earlier or later departure from the theoretical constant for the actual average dates of the event of beginning of wheat harvest.

"Knowing the number of days' departure of a given season from the average, the departures of the date of an event from the theoretical constant for a region and the date of the event for the season at a given base, the corresponding later or earlier date for any other place will be the computed date for the place, plus or minus the number of days in the seasonal and regional departures."

Illustrations of the application of these principles are given and examples of their use as an aid to research, presented.

Climate of Illinois, J. G. MOSIER (*Illinois Sta. Bul. 208 (1918), pp. 5-125, figs. 15; abs., pp. 8, fig. 1*).—This is a review of the characteristic features of rainfall, temperature, wind, and sunshine and cloudiness, based upon observations by the experiment station at Urbana and by the U. S. Weather Bureau in different parts of the State.

Since the State is entirely within the belt of prevailing westerly winds and the weather changes are almost entirely due to the passage of cyclonic storms across the country, the relation of cyclones and anticyclones to weather changes is explained. Knowing the direction and rate of movement of these cyclones it is comparatively easy to predict the major weather changes of the State.

For convenience of comparison the State is divided into five districts—extreme northern, central-northern, central, central-southern, and extreme southern. "The extreme northern district includes counties that are on the border of the corn belt. The central-northern and the central divisions include the corn belt proper, while the central-southern includes practically all that portion of the State in the lower Illinoian glaciation. The seven southern counties

are unglaciated and form a distinct soil and physiographic region by themselves."

The average annual rainfall of the State is 37.98 in., the amount being sufficient almost every year to produce maximum crops. However, it is not always so distributed as to produce this result. The distribution of the rainfall by months varies with the different sections of the State. "In the extreme northern and central-northern districts the six months, April to September, form the period of greatest rainfall, while in the extreme southern district the precipitation is more evenly distributed, with August, September, and October as the driest months." The uneven distribution of the rainfall makes it important to take every precaution for conserving the water supply. The average annual precipitation for the extreme northern district is 33.99 in., of the central-northern district 34.26 in., of the central district 36.89 in., of the central-southern district 41.48 in., and of the extreme southern district 43.28 in. "The average annual snowfall for the central-southern and extreme southern districts is 17.5 in., for the central 23.3 in., and for the central-northern and extreme northern 31.7 in. The average for the State is 24.7 in."

From the extreme northern to the extreme southern boundaries of the State there is a difference of 11° in mean temperature and 4½ weeks in the length of the growing season. In the northern end of the State early-maturing varieties of corn must be used and even these are sometimes badly damaged by early frosts. Taking 49° F. as the zero point for the growth of corn, it is calculated that the number of degree-hours—that is, hours from May 20 to September 15—in which the temperatures are above 49° in the different sections of the State are as follows: Extreme northern 57,910, central-northern 60,860, central 67,240, central-southern 72,600, and extreme southern 76,560.

"From 1876 to 1915 the average number of degree-hours for the State for the growing of corn was 66,708 per year. The highest number in any one season was 75,240 in 1901, and the lowest number was 57,930 in 1882. The average yield of corn for the State for the former year was 21 bu. and for the latter 24 bu. During this 40-year period, 21 years have been above normal in number of degree-hours, with an average yield of 30.4 bu. of corn per acre, for the State, while 19 years have been below normal, with an average yield of 33.6 bu., showing that better yields are obtained when the temperature is slightly below normal." The lower yields during the years of higher temperature are explained by the fact that higher temperature is correlated with low rainfall.

Observations on the temperature of the soil at depths of from 1 in. to 36 in., recorded at the station from 1901 to 1916, inclusive, are tabulated and briefly discussed. These observations show that during most winters the soil froze to a greater depth than 12 in. and in some cases to twice that depth.

The average dates of last killing frost in spring and first in autumn in the State are shown in the following table:

Average date of killing frosts in Illinois.

District.	Last in spring.	First in autumn.	Number of days in growing season.
Extreme northern.....	May 4	Oct. 12	161
Central northern.....	May 2	Oct. 15	166
Central.....	Apr. 26	Oct. 16	173
Central southern.....	Apr. 15	Oct. 20	188
Extreme southern.....	Apr. 14	Oct. 24	193

The prevailing direction of the wind is west. The relation of wind movement to evaporation and the value of windbreaks and crops in reducing evaporation are briefly discussed.

"December, January, February, March, and April are the cloudy months of the year, having sunshine for only 45.6 per cent of the time possible, while the other months have sunshine for 56.4 per cent of the time. August has the greatest amount of sunshine, 60.6 per cent, while December has least, 42.3 per cent. The extreme southern part of the State has the least amount of sunshine for the year, 47.7 per cent. December and January in this district have only 39.3 per cent." The average annual sunshine for the whole State is 51.9 per cent.

At Urbana the mean humidity for November to March, inclusive, is 83.5 per cent, for the other months of the year, 74.2 per cent.

The climate of Michigan and its relation to agriculture, D. A. SEELEY (*Michigan Sta. Rpt. 1917, pp. 679-715, figs. 18*).—This paper describes the climate of Michigan and explains its peculiarities, correlating the climate as described with the agriculture of the State.

It is pointed out that the temperature, as in other sections, decreases "about 1° per 100 miles in distance away from the equator. A rise of 300 ft. in elevation causes a drop in temperature of about 1° F. The presence of the Great Lakes causes marked differences in the climate of Michigan, as compared with other sections. The windward side of the lakes has a much more equable temperature, more snowfall and cloudiness in winter, and more sunshine in summer, than interior regions. The fact that Michigan is in the direct path of cyclones and anticyclones results in frequent weather changes, more precipitation which is well distributed, and invigorating weather conditions generally. On the whole the climate of Michigan is not extreme in temperature, either in summer or winter, the rainfall is sufficient for most crops, the greater portion of the year's supply falling during the growing season; the cloudiness is greater in winter and less in summer than in regions remote from the Great Lakes; the humidity is rather high throughout the year, especially on the lake shores; the prevailing winds are westerly, often high on the lakes but decrease as they pass inland. Severe local phenomena such as hail, tornadoes, torrential rains, etc., occur infrequently.

"The usual cereal crops grown in the central valleys are raised in Michigan. Corn can be grown about as successfully in southern Michigan as in the 'corn belt,' but the seasons are often too short in the northern portion of the State to mature the crop. Wheat, oats, rye, barley, potatoes, beans, [and] sugar beets are all important crops, while many minor crops are also produced. There are localities where each seems to find particularly favorable climatic conditions in the State, which has an unusually wide variation in climate. The 'fruit belt' along the Lake Michigan coast is peculiarly adapted as to climate for growing fruit on account of its cool springs, moderate summers with much sunshine, late falls, and mild winters with much snow and cloudiness.

"The climate is not changing as shown by a study of over 50 years of records made at the Michigan Agricultural College."

A list of publications cited is given.

Free-air data at Drexel Aerological Station, July to December, 1916, W. R. GREGG (*U. S. Mo. Weather Rev. Sup. 8 (1918), pp. 111, pls. 6*).—This is a record of the data obtained in 267 observations at Drexel, Nebr., with kites reaching an average altitude of 2,852 meters (1.77 miles). A table is also given which compares free-air temperatures at Drexel, Nebr., and Mount Weather, Va.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 5 (1918), Nos. 1, pp. 218, pls. 3, figs. 4; 2, pp. 215,*

pls. 3, figs. 3).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1918, respectively.

Climatological data (*Idaho Sta. Bul. 104 (1918), pp. 8, 9*).—Tabular summaries are given of observations on temperature, cloudiness, and precipitation at the central station at Moscow, and at the substations at Aberdeen, Caldwell, Jerome, and Sandpoint, Idaho, for each month of 1917.

SOILS—FERTILIZERS.

Soil survey of Rapides Parish, La., E. H. SMIES ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 43, fig. 1, map 1*).—This survey deals with the soils of an area of 865,920 acres situated in central Louisiana.

The uplands, constituting about 60 per cent of the total area of the parish, are largely undulating to gently rolling, but include extensive nearly level areas and some that are quite rolling. The rolling lands are well drained, while in the level areas the natural drainage is imperfect. The stream bottoms are mainly level and subject to overflow, and in the western part of the section scattered areas of nearly level second-bottom lands occur.

The upland soils of the parish are all derived from Coastal-Plain sediments which consist of beds of unconsolidated sands, sandy clays, and more or less gravel. The stream bottom and terrace soils consist of alluvial material. Twenty soil types of 12 series are mapped, exclusive of swamp. Miller clay, Ruston fine sandy loam, Susquehanna very fine sandy loam, and Ochlockonee silt loam predominate, occupying 17.6, 16.4, 14.8, and 10.7 per cent of the total area, respectively.

Soil survey of Dodge County, Nebr., B. W. TILLMAN and H. C. MORTLOCK (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 53, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 339,840 acres lying in the east-central part of the State, 30 miles west of the Missouri River. About one-third of the county is upland, one-third bottom, and the remainder terraces, the topography varying from flat to slightly hilly. The bottom lands lie at an elevation of approximately 1,200 to 1,300 ft. above sea level, and the uplands range from 120 to 150 ft. higher. Drainage is well established, except in certain depressed areas in the bottoms.

The upland soils of the county are loessial in origin. The terrace soils represent former valley-filling deposits, the lower-lying material being sand and the upper part mainly reassorted loesslike material. The first bottom soils are alluvial in origin. Twenty-one soil types of 9 series are mapped, exclusive of riverwash. Marshall silt loam, Wabash silt loam, and Waukesha silt loam predominate, occupying, respectively, 25.6, 23.2, and 20.3 per cent of the total area.

Soil survey of Hall County, Nebr., J. O. VEATCH and V. H. SEABURY (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 41, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 337,920 acres situated in the south-central part of the State and lying near the eastern margin of the Great Plains. In general the surface is smooth to slightly uneven and gently undulating, there being no conspicuous topographic relief. The elevation of the county ranges from about 1,820 to 2,100 ft. above sea level, with uplands occupying approximately 31.6 per cent of the total area. Adequate natural drainage is said to prevail throughout the greater part of the region.

The soils of the area resemble those of the humid rather than those of the semiarid region, the greater part being derived from old and recent alluvium

laid down in the valley of the Platte River, which flows northeast across the county. The upland soils are derived mainly from the underlying formations of yellow silt, known as Plains Loess. Alluvial soils border the Platte River and cover 22.5 per cent of the county. Twenty-six soil types of 11 series are mapped, Hall silt loam, occupying 20.2 per cent of the total area, predominating.

Washing of soils and methods of prevention, J. G. MOSIER and A. F. GUSTAFSON (*Illinois Sta. Bul. 207 (1918), pp. 512-550, figs. 32*).—Based on the results of detailed soil surveys made in 62 counties of Illinois, it is stated that 15.2 per cent of the land is of such a character as to be subject to serious damage from surface washing, or run-off. Soil erosion from this cause is described as being due to (1) sheet erosion, or general surface washing, and (2) to gullying, including headwater and waterfall erosion. The effects of erosion upon the soil organic matter, nitrogen, and phosphorus and upon the physical character of the soil are discussed. Data are presented showing the organic matter, nitrogen, and phosphorus present in the surface stratum (0 to 6½ in.) of representative timber soils and of bottom lands receiving their wash, also that present in the subsurface stratum (6½ to 20 in.) of representative timber soils.

Methods of reducing erosion are described, with particular reference to the elimination of sheet washing. The measures deemed best for the prevention of sheet washing include (1) growing cover crops, (2) increasing the organic matter content, (3) employing proper tillage methods, (4) tiling, and (5) constructing terraces and embankments. Means for dealing with gullies embrace reforestation and damming with straw and sod held in place by stakes or by concrete.

Reclamation experiments were begun in 1906 on badly eroded abandoned land in Johnson County to test different methods of reducing erosion. Corn, cowpeas, wheat, and clover were grown in a 4-year rotation, and the rather conflicting results are reported for each year. The average yields of the protected areas were 30.6 bu. for corn, 11.1 bu. for wheat, and 0.82 ton for clover, in comparison with yields for the unprotected area of 14.1 bu., 4.6 bu., and 0.21 ton, respectively. The increased yields were deemed sufficient to pay for all labor involved in filling gullies and building terraces and maintaining them, together with a fair profit.

"Increasing and maintaining the organic matter, using cover crops, keeping the land in pasture and meadow as much as possible, and practicing deep contour plowing and planting are the most practical means for reducing soil washing in Illinois. If these methods are practiced, much of the badly eroded land can be cultivated with profit."

Report of the soil physicist, M. M. McCool (*Michigan Sta. Rpt. 1917, pp. 337-342*).—Chemical and physical studies of the soil classes found in St. Joseph, Allegan, and Ingham Counties, Mich., are briefly noted, and the conclusion is reached that phosphorus is an important factor in increasing crop production on these soils.

Comparisons of the lime requirement of virgin and cropped soils of these counties by the Jones, Veitch, and freezing point methods were made by R. S. Bogan. The different methods gave widely varying results for the same soil samples. The virgin soils often showed a higher lime requirement than cropped soils upon which clover failed to grow, leading to the conclusion, since virgin soils would doubtless produce many excellent crops of clover without the use of either lime or manure, that the field trial method is the only reliable means of determining the optimum amount of lime to apply.

Observations on the availability of water for oats grown in Coloma sand in galvanized iron cans varying in depth from $\frac{1}{2}$ to 8 ft., and receiving surface watering until the plants were well started, are said to confirm the conclusion reached in field experiments that the water table in sand of this character must be very near the surface in order to grow normal crops.

Soluble salts in the soil solution were observed to move from regions of high to those of lower concentration even in closed containers, the movement being accompanied by changes in the composition of the soil solution.

Alkalis in Colorado (including nitrates), W. P. HEADDEN (*Colorado Sta. Bul. 239 (1918), pp. 3-58*).—A detailed discussion is given of the origin and character of the alkalis and of the nitrates found in Colorado soils based upon studies of their occurrence and composition in river waters, ground waters, well waters to a depth of 923 ft., and in the soil.

The so-called "white alkalis" (sulphates and chlorids) are said to be most prevalent. To a large extent these materials have been washed from the higher parts of the field into the lower parts, where, for lack of adequate drainage, the water collects and evaporates, leaving the alkalis as white deposits. Seepage water also carries some of the alkali down to the lower soil levels, as well as any sulphid of iron formed by the action of the air, which, in turn, aids in the formation of sulphates. The bad effect of the white alkalis is thought to have been overestimated, although there is believed to be a limit to the amount that may be present in the soil without danger to the crops or trees. This limit is so high in semiarid soils, however, that it has never been observed.

Sodium carbonate or "black alkali" was found to be very generally present in small quantities as a direct result of the action of carbonated water on the rock particles both in the mountains and in the soil, but it is said to pass into the drainage to such an extent as to prevent its accumulation except under unusual conditions. Where this material occurs in injurious quantities, irrigation by flooding and the application of gypsum is deemed to be a good practice, although it is not regarded as a complete remedy.

The nitrates, often mistaken for black alkali, occur as "brown spots" in sufficient quantities to be injurious to crops. These nitrate accumulations are believed to be formed through successive biochemical changes from atmospheric nitrogen fixed by *Azotobacter*. The characteristic brown color is said to be due to the brown pigment sometimes formed by this organism in the presence of nitrates. An excess of nitrate, however, may occur without the appearance of any brown color. Sodium carbonate in small amounts is thought to favor the activities of *Azotobacter*, the amount required to retard their development being greater than that which will injure ordinary cultivated plants.

Relation between biological activities in the presence of various salts and the concentration of the soil solution in different classes of soil, C. E. MILLAR (*Jour. Agr. Research [U. S.], 13 (1918), No. 4, pp. 213-223*).—In the studies here reported, conducted at the Michigan Experiment Station, 100-gm. samples of three kinds of soil, sand, sandy loam, and clay loam, were mixed with 2 gm. of dried blood and incubated in tumblers, with the addition in different series of magnesium sulphate, calcium nitrate, calcium chlorid, and potassium chlorid, at rates of from 0.001 to 0.7 per cent. The effect of these additions on production of ammonia after four days incubation at 29 to 30° C., in depressing the freezing point, and on osmotic pressure, was determined.

From the results obtained the conclusion is reached that "since the osmotic pressure at which ammonification of dried blood is depressed in sandy loam by the addition of various salts is different for each salt tested, it seems improbable that osmotic pressure is the governing factor. This conclusion is further strengthened by the observation that ammonification proceeds unim-

paired in sand where the osmotic pressure of the soil solution is between 13 and 14 atmospheres, while in sandy loam the process is depressed when the osmotic pressure reaches 4 to 6 atmospheres and in clay loam at a pressure of about 9 atmospheres.

"The effect of various salts on ammonification is apparently modified very materially by the nature of the soil used. Thus, for the four salts studied, each gave a definite point where the ammonification of dried blood in sandy loam was depressed, while only one salt gave such a point with clay loam. The cause of such variations is yet to be investigated, but it seems possible that the chemical reaction between the salt added and the soil constituents may play some part.

"The addition of the amount of dried blood usually used in ammonification work has a very appreciable effect on the osmotic pressure of the soil solution, the increase varying with the class of soil used."

Soil bacteriology, W. A. WITHERS (*North Carolina Sta. Rpt. 1917, p. 32*).—Observations of the effects of different constituents in nutrient solutions upon nitrification and ammonification are stated to indicate that in solutions filtered for the removal of precipitates (chiefly ferric phosphate, but sometimes secondary calcium phosphate) nitrification was materially checked; that calcium carbonate apparently favored nitrification; that calcium carbonate seemed to liberate ammonia from ammonium sulphate; a large loss of nitrogen occurring in all solutions, but usually being greater in the uninoculated solutions; and that dipotassium phosphate, ferric sulphate, and magnesium sulphate appeared to give better results than monopotassium phosphate, ferrous sulphate, and magnesium chlorid. Studies of the effect of the container showed that rectilinear containers resting on their largest side during incubation were much superior to Erlenmeyer flasks.

The direct microscopic examination of bacteria in soil, H. J. CONN (*Abstr. Bact., 1 (1917), No. 1, pp. 40, 41*).—A staining technique, for use in the direct microscopic examination of soil organisms, is briefly described. The method is believed to permit a study of the forms of fungi, Actinomycetes, and bacteria as they actually occur in the soil medium.

The microscopic study of bacteria and fungi in soil, H. J. CONN (*New York State Sta. Tech. Bul. 64 (1918), pp. 3-20*).—A method of staining dried soil infusions is described which is somewhat similar to the one already used for milk (E. S. R., 35, p. 70), by means of which direct microscopic studies of the soil bacteria are believed to be possible. These studies are intended to give, first, an idea of the actual number of bacteria present in the soil and, second, information as to the kinds of microorganisms present in active form. The technique noted above has been slightly modified, and is described in detail. The limitations of the method are discussed, and are said to arise primarily through the difficulty experienced in distinguishing between the smallest soil bacteria and minute particles of dead organic matter. The results of determinations of the number of bacteria in normal field soil, manured soil, and sterilized soil reinoculated with pure cultures of different organisms are presented as obtained by both plate and microscopic counts. The presence of fungi in the soil and the arrangement of the soil bacteria are also discussed.

The author concludes that the microscope shows the actual number of bacteria in soil to be probably five, ten, or even twenty times as great as indicated by the culture plate method. This discrepancy is thought to be due to bacteria that do not grow on the plates rather than to the occurrence of large clumps that do not break up in the process of plating, as indicated by the fact that a large majority of soil bacteria occur singly. Additional evidence is said to confirm previous observations (E. S. R., 37, p. 516) that the large

spore-forming bacteria (*Bacillus megatherium* and *B. cereus*), which are abundant on culture plates made from soil, actually occur in normal soil only as spores. These spores, moreover, form a very small proportion of the total bacterial flora of soil.

Fungus mycelium was not found in any soil except where an unusual amount of organic matter occurred, as in the leaf mold of woodland soil. Filaments of Actinomycetes were found, although in much smaller numbers than the spores of these organisms. In the case of fungi and Actinomycetes, the plate count is not an index of activity, but of ability to produce spores. In general, then, it is thought that when an organism is concerned that produces spores or any other resting stage the significance of the plate count can not be determined unless the microscope is used to show whether the organism is present in active form.

The influence of various woods on bacterial activity in the soil, T. L. HILLS and J. J. PUTNAM (*Idaho Sta. Bul. 104* (1918), pp. 16-18).—In a continuation of work previously noted (E. S. R., 37, p. 20), studies have been made of nitrogen assimilation by *Azotobacter* in mannite solutions to which the different woods under observation (white and yellow pine, white and red fir, larch, cedar, maple, and ash) have been added as sawdust. A marked influence on the increase in total nitrogen was observed in the different woods, cedar causing almost no increase and maple and ash as much as occurred in the checks.

Preliminary observations are said to indicate that a slight increase in numbers of bacteria occurred in soil to which the same quantity of wood was added as was used in the biological studies noted above.

A correlation between bacterial activity and lime requirement of soils, F. E. BEAR (*Soil Sci.*, 4 (1917), No. 6, pp. 453-462, figs. 4).—Extensive laboratory and field experiments are described in a study of the effect of lime applied in varying amounts to Dekalb silt loam soil from West Virginia and to Wooster silt loam from Wooster, Ohio, with lime requirements of 3,500 lbs. of calcium carbonate, each, per 2,000,000 lbs. of soil (Veitch), upon the number of bacteria present in the soil; the rate of ammonification, nitrification, and symbiotic (*Bacillus radicicola* of *Soja max*) and nonsymbiotic nitrogen fixation; soy beans under field conditions; and upon the bacterial activities of 12 samples of Dekalb soils from West Virginia with lime requirements ranging from 400 to 4,600 lbs. of calcium carbonate per 2,000,000 lbs. of soil. The effect of fertilizers upon the bacterial activities of these soils was also studied. "In view of the fact that large areas of land are acid and that the distance from the supply of lime often makes the cost of applying large amounts of lime or limestone prohibitive, it was thought it might be desirable to consider more carefully the possibilities of a system of acid agriculture as suggested by Coville" (E. S. R., 30, p. 23).

Large samples of soil were obtained and carefully analyzed for total nitrogen, phosphorus, potassium, calcium, magnesium, and carbon, in addition to lime-requirement determinations. Calcium carbonate was added in amounts varying from 250 to 40,000 lbs. per 2,000,000 lbs. of soil and mixed thoroughly with the soil. The mixture was then placed in 1-gal. stone jars, and sufficient water was added to bring it to an optimum moisture content. Each week the soil was removed from the jars, thoroughly mixed, and the loss of moisture restored. After 12 weeks determinations were made of the number of bacteria and of nitrification, ammonification, and symbiotic and nonsymbiotic nitrogen fixation. These determinations required about one-half of the soil. To the remainder was added monocalcium phosphate equivalent to 1,000 lbs. of phos-

phorus per 2,000,000 lbs. of soil, the moisture content restored, and mixing continued for another 12 weeks, when the above mentioned determinations were repeated. The results are presented in tabular form and fully discussed.

"The data accumulated show that the various groups of soil organisms vary in their response to applications of calcium carbonate. Ammonification proceeded fairly satisfactorily in most of the soils without the application of lime. The use of moderate amounts of calcium carbonate increased the rate of ammonification in most cases. Small applications were much more effective, relatively, than large applications. The rate of nitrification was almost directly correlated with the amount of calcium carbonate supplied. Excessive applications were not injurious to the nitrifying organisms. Soils having high lime requirements showed practically no nitrification, until calcium carbonate had been mixed with them. Nitrogen fixation by nonsymbiotic soil organisms was considerably increased by the addition of calcium carbonate. The application of monocalcium phosphate also was necessary for maximum nitrogen fixation. All of the soils studied accumulated considerable amounts of nitrogen when incubated in Ashby's solution [E. S. R., 18, p. 721] without the addition of calcium carbonate, although its use increased the rate of nitrogen fixation.

"A lime requirement of 3,000 lbs. was not sufficient to prevent a good growth of soy beans on soil well fertilized with acid phosphate or manure. Nitrogen fixation accompanying the growth of soy beans took place readily in acid soils. This fixation was increased by small applications but decreased by large applications of calcium carbonate."

From these observations the following conclusions were deemed justified:

"Plants which are able to utilize ammonia nitrogen need not suffer from nitrogen hunger when grown on soils having lime requirements no higher than those studied in these investigations. Plants which depend on nitrates as their source of nitrogen may suffer from the lack of available nitrogen in soils having high lime requirements, unless these requirements have been at least partially satisfied. The supply of nitrogen in acid soils may be maintained by growing acid-resistant legumes, of which the soy bean is one. Undoubtedly, the use of acid phosphate aids materially in the nitrogen-fixation processes in acid soils. Small applications of calcium carbonate are, as a rule, relatively more effective than large applications as a means of increasing the bacterial activities in acid soils."

A bibliography of 41 titles is appended.

The effect of green manuring on soils, A. W. DRINKARD, JR. (*Virginia Sta. Rpt. 1917, pp. 20-22*).—Supplementing greenhouse and pot experiments previously noted (E. S. R., 33, p. 721), a brief summary is presented of laboratory and field work planned to study the effect of green manuring on chemical and bacteriological processes in the soil and on crop yields.

Observations covering a 4-year period are held to indicate that the nitrogen-fixing power of the soil organisms has been materially increased under green manure treatment, that the humus and carbon contents of the soil have been augmented, and that the physical condition has been greatly improved. Additional work is said to corroborate the conclusion already reached that soil acidity due to the incorporation of green materials in the soil is transitory.

Average yields of corn for the period of 1912 to 1917, inclusive, were obtained as follows: Following clover turned under 44.63 bu. per acre, following clover cut for hay 37.77 bu., following rye turned under 18.61 bu., following rye cut for hay 25.66 bu., and 19.17 bu. for the check. Average wheat yields for the three years 1912, 1914, and 1916 amounted to 19.52 bu. per acre following soy beans cut for hay, 22.96 bu. following soy beans turned under, 13.28 bu. following buckwheat cut for hay, 14.72 bu. following buckwheat turned under,

and 14.82 bu. for the check. Additional experiments dealt with the effect of turning under green manure crops at different stages of development, and are said to indicate a gradual diminution of protein in maturing plants.

The fertilizer needs of the United States, H. J. WHEELER (*Quart. Jour. Econ.*, 32 (1918), No. 2, pp. 209-237; *abs. in Chem. Abs.*, 12 (1918), No. 10, p. 1095).—This article discusses briefly the fertilizer requirements of the country and the sources from which it may draw its needed supplies of nitrogen, phosphoric acid, and potash. It notes especially a great shortage of organic ammoniates considered essential in the manufacture of fertilizers of good mechanical condition, the inadequate supply of sulphuric acid to meet both war purposes and the demand for fertilizer manufacture, and the inadequacy of the present domestic supply of potash. The opinion is expressed that "the only present hope for an adequate and sufficiently cheap supply of potash salts to meet German competition fully rests on the possibility of the discovery of great deposits of crystalline potash salts in this country, similar to those of Central Germany, Alsace-Lorraine, Galicia, and those claimed to have been discovered in Spain and Abyssinia. The prospect of discovering such deposits in the United States by chance borings is too slight to attract private capital. The undertaking is one which the Federal Government could and ought to promote."

The high cost of bumper crops, E. DAVENPORT (*Country Gent.*, 83 (1918), No. 7, pp. 3, 4, 64).—This article emphasizes especially the importance of taking into account the deterioration of soils due to the removal of fertility in cropping.

Soil test experiment at Aroostook Farm, C. D. WOODS (*Maine Sta. Bul.* 269 (1918), pp. 17-30, figs. 3).—This presents a brief outline of fertilizer experiments begun in 1917 on Caribou loam soil with potatoes, oats, and clover grown in rotation, and includes a plan of the experiment, a discussion of the fertilizers used, and a description of the field arrangement of the plats. The triangular diagram suggested by Schreinmayer and adapted by Schreiner (*E. S. R.*, 24, p. 32) to use in plant nutrition work has been employed in planning the various fertilizer applications. A standard 5:8:7 fertilizer was used as a starting point and applied to potatoes at the rate of 1,200 lbs. per acre, to oats at the rate of 300 lbs., and as a top dressing on mowing fields at the rate of 150 lbs. One-third of the nitrogen was present as ammonium nitrate and two-thirds as sulphate of ammonia, the phosphoric acid was in the form of acid phosphate, and the potash (all water soluble) in the form of sulphate. Additional potato plats included a comparison of 5:8:7 and 3:8:10 fertilizers, finely ground floats with acid phosphate, and dried blood and tankage with mineral nitrogen. The yields obtained the first year on each plat of potatoes and oats are presented in tabular form and briefly discussed.

The oat yields were irregular, due to an uneven stand, and are included only as a matter of record. Maximum potato yields paralleled closely the nitrogen applications, while phosphorus and potash were not deemed to be limiting factors. However, observations made on different fields of Caribou loam (see p. 335) are held to indicate that this soil was not necessarily deficient in nitrogen.

The value of nitrate of soda in crop production, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Bul.* 323 (1918), pp. 4-34, figs. 3).—The authors present a comprehensive review of experimental work covering more than 20 years, most of which has already been noted from other sources, together with the results of some recent fertilizer experiments with potatoes and corn to show the effect of nitrate of soda upon different crops grown in various sections of the State and in an effort to determine its relative value under present market conditions. In all the calculations the nitrate of soda was valued at

\$90 per ton, and the farm crops at prices deemed conservative for 1917. The conclusions reached have been briefly summarized as follows:

"Nitrate of soda used at the rate of 100 to 160 lbs. per acre on soil of medium quality, well supplied with the mineral fertilizers (phosphoric acid and potash), almost invariably increases the yield of general farm crops, potatoes, and vegetables, and, taking what seem to be fair prices for 1917, this increase is shown to be sufficient in nearly all cases to give a fair profit over the cost of the nitrate. It has been shown further that, unit for unit of nitrogen, the nitrate usually gives a greater increase than sulphate of ammonia or the organic sources of nitrogen. Net increases in value varying from a few dollars to more than \$150 per acre have been noted, depending on the crop and the season. In only a few cases were losses noted, and in two of these nitrate of soda was used on leguminous crops.

"General farm crops and hay in a 5-year rotation in field plats gave an average annual net increase in value of about \$3.85 per acre for 160 lbs. of nitrate of soda. Higher returns were secured with the same crops when grown in cylinders where conditions were more largely under control than in field experiments. Tomatoes and other vegetables gave net increases amounting in most cases to more than \$30 per acre and in some cases to more than \$100 per acre. For potatoes, nitrate of soda, when used in connection with phosphoric acid and potash, gave larger yields than equivalent amounts of sulphate of ammonia, tankage, or fish. When the nitrate of soda and sulphate of ammonia were combined, the results were quite as good and in some cases better than when the nitrate was used alone. In a 5-year test with peaches, nitrate of soda gave an annual net gain of \$58 per acre."

The extraction of potash and other constituents from sea water bittern, J. H. HILDEBRAND (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 2, pp. 96-105, figs. 12; *abs. in Amer. Jour. Sci.*, 4. ser., 45 (1918), No. 267, pp. 231, 232).—This article reviews the work of van't Hoff and others on the relationships of the single and double salts in deposits from sea water in their application to the practical problem of recovering potash and other salts from bitterns. It outlines the following process based on the author's laboratory experiments:

Evaporate bittern till boiling point becomes about 120°, and density (hot) 1.35. Separate solid and liquid while hot (settling tank and centrifuge).

A. Solid. NaCl and $\text{MgSO}_4 \cdot \text{H}_2\text{O}$. Dissolve out NaCl with cold water (containing some MgCl_2); dissolve residue in hot water and cool with ice machine, getting $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$.

B. Liquid. Cool.

I. Solid carnallite. Extract with minimum amount cold water, leaving—

1. Solid KCl.

2. Solution. Evaporate partly, cool.

a. Solid carnallite, add to I.

b. Solution of MgCl_2 , add to II.

II. Solution, mainly MgCl_2 . Bleach with Cl_2 and remove Br. Evaporate, cool, recover solid $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$.

The direct heat treatment of cement mill dust to increase its water-soluble potash content, A. R. MERZ (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 2, pp. 106-109, fig. 1).—The potash in the dust from a cement mill using oil as fuel was found to be 92 per cent soluble in water while that from mills using powdered coal as fuel was only 42 to 60 per cent soluble. The author found that ignition of the latter for a short time (20 to 60 minutes) in an oxidizing atmosphere at temperatures of 600 to 1,100° F. converted the insoluble potash into a readily soluble form.

Effect of coal ash on the liberation and nature of cement mill potash, N. S. POTTER, JR., and R. D. CHEESMAN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 2, pp. 109-111, fig. 1; *abs. in Amer. Jour. Sci.*, 4. ser., 45 (1918), No. 267, p. 232).—The authors show in this article that the potash content of coal ash is considerable, amounting in some cases to about 5 per cent, largely insoluble, and since in the processes used in cement mills this ash passes into the dust recovered it is thought to be the principal source of the insoluble potash in the dust. "Taking into consideration the K_2O content of ash and the K_2O in raw mix carried over mechanically there is apparently no 'recombination' of the volatilized K_2O with the siliceous ash particles."

The central Kentucky phosphate field, W. C. PHALEN (*Ky. Geol. Survey [Pub.]*, 1915, pp. 80, pls. 13, figs. 4; *abs. in U. S. Geol. Survey Press Bul.* 353 (1918), p. 1).—This is a detailed report on the phosphate field of central Kentucky.

The principal deposits occur near Midway in Woodford County, but phosphate rock is also found in Fayette, Scott, Franklin, Jessamine, and Clark Counties. The most valuable deposits are those near Midway and Lexington. Numerous analyses of samples from different parts of the field indicate that there is a considerable amount of high-grade phosphate as well as much of low and intermediate grade. The abundant supply of flowing water for washing the rock and the ample railroad facilities of the region "make the Kentucky field worthy of attention."

"The Kentucky phosphate is in practically a virgin field. The local conditions in the Tennessee and Kentucky phosphate fields are similar, and the deposits in Kentucky must be worked in about the same way as those in Tennessee. For this reason the report gives a brief description of the methods followed in Tennessee in mining phosphate rock and preparing it for market. The report gives detailed descriptions and analyses of the phosphate rock, maps, and sections, as well as general conclusions with reference to the outlook for the field."

Production of lime in 1917 (*U. S. Geol. Survey Press Bul.* 353 (1918), pp. 2, 3; *abs. in Off. Bul. [U. S.]*, 2 (1918), No. 240, p. 12).—From data collected by the U. S. Geological Survey it is estimated that the "production of lime made and sold in 1917 in the United States, including Porto Rico and Hawaii, was 3,663,818 short tons, a decrease of 10 per cent compared with the revised total for the record year, 1916, which was 4,073,433 short tons. It surpassed, however, all records, previous to 1916.

"Of the 42 producing States only 11 reported increased sales. Virginia and Indiana were the only States in the group having sales of more than 100,000 tons to show increase, which amounted to 1 per cent and 3 per cent, respectively. Other States of this group showed decreases ranging from 5 per cent (Pennsylvania) to 36 per cent (Wisconsin). Vermont, with an output of 53,143 tons, showed an increase of 23 per cent."

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, C. S. CATHCART ET AL. (*New Jersey Stat. Bul.* 318 (1917), pp. 4-51).—Supplementing the work previously noted (*E. S. R.*, 39, p. 222), the remaining analyses of samples of commercial fertilizers and fertilizing materials collected during the 1917 inspection are presented in this bulletin, together with a discussion of the entire 1917 inspection. A total of 1,445 samples was received for analysis. Deficiencies in one or two plant food elements were found in 31 per cent of the brands examined.

Analyses of 21 official samples of burned limes, oyster shell limes, and limestone are also reported.

A list of brands registered for sale since January 22 for the fiscal year ended October 31, 1917, is included.

Fertilizer registrations for 1918, C. S. CATHCART (*New Jersey Stat. Bul.* 321 (1918), pp. 5-39).—This presents a tabulated list of all the brands of fertilizing material and mixed fertilizers registered to date in New Jersey for the fiscal year ended October 31, 1918.

AGRICULTURAL BOTANY.

Correlation of morphological variations in the seedling of *Phaseolus vulgaris*, J. A. HARRIS and B. T. AVERY (*Bul. Torrey Bot. Club*, 45 (1918), No. 3, pp. 109-119).—The authors present the results of an attempt to determine some of the correlations in the structural variations of the seedling of *P. vulgaris*, the materials having been drawn from a series of lines of navy beans grown during several years under controlled conditions. The conclusions drawn are not considered applicable to certain entirely abnormal races.

Abnormal as compared with normal seedlings show more frequently both the fasciation-like broadening of the axis and its longitudinal division. Seedlings which are normal except for the separation of the cotyledons and those which have three cotyledons and a normal pair of primordial leaves or those which have three cotyledons and a whorl of three primordial leaves, as compared with those which are normal in their cotyledonary and primordial leaf characters, produce a larger number of leaves and leaflets and a higher percentage of leaves with lobes at the third node. Seedlings which are tricotyledonous, with either a normal pair or a whorl of three primordial leaves, show higher percentages of variation in the axis, or the leaves produced by the axis, distal to the primordial leaves than do those which are normal except for the separation of the two cotyledons.

These studies are to be continued.

A variation in *Plantago lanceolata*, P. WEATHERWAX (*Proc. Ind. Acad. Sci.*, 1916, pp. 365-367, figs. 2).—The author describes in a preliminary report a variant form of *P. lanceolata* which was kept under observation for nearly a year after it was found (near Bloomington, Ind.), in 1915.

The inflorescence, instead of being a spike as in normal plants, is made up of a number of short, conical spikes arranged in a conical aggregation around the end of the scape as a central axis, the stalks of some of these spikes being considerably elongated. Apparently only a few of the flowers function, and many of these lack normal stamens. The abnormality resembles somewhat the result of disease or insect injury, but no causal organism has been found. Some of the seeds of the plant have germinated, and these may afford opportunity for further study of the abnormality.

The interrelationship of the number of stamens and pistils in the flowers of *Ficaria*, J. A. HARRIS (*Biol. Bul. Mar. Biol. Lab. Woods Hole*, 34 (1918), No. 1, pp. 7-17, figs. 5).—In the present study dealing with the problem of relationships between the number of sporophylls laid down and the relative number of stamens and pistils in *Ficaria*, constants have been deduced for eight series of published data not hitherto analyzed by the methods which are now available. In flowers with larger numbers of sporophylls, the pistils are relatively more numerous than the stamens. This relationship is thought to be one of real morphological significance.

A remarkable case of fasciation in *Oenothera biennis*, P. WEATHERWAX (*Proc. Ind. Acad. Sci.*, 1916, pp. 363, 364, fig. 1).—A remarkably fasciated but apparently healthy specimen of *O. biennis* is described.

Linkage in maize: The C aleurone factor and waxy endosperm, T. BREGGER (*Amer. Nat.*, 52 (1918), No. 613, pp. 57-61).—To the evidence presented by Collins (E. S. R., 27, p. 769) of linkage between waxy endosperm and aleurone color in maize, the author claims to have added evidence from back crosses showing the intensity of the linkage in the material studied to be equivalent to 26.7 per cent of crossing over. It is said to have been shown directly that the C factor for aleurone is linked with the factor for waxy endosperm.

Maternal inheritance in the soy bean, H. TERA0 (*Amer. Nat.*, 52 (1918), No. 613, pp. 51-56).—It is claimed that certain characters of *Glycine hispida* are inherited on the maternal side only. A brief notice is given of inheritance studies which are held to establish that fact. The characters involved were the two types of cotyledon color, yellow and green, and the two types, green and yellow, of the seed coats associated with the yellow cotyledons, the green cotyledons having always green seed coats.

Plant physiology, R. P. HIBBARD (*Michigan Sta. Rpt. 1917*, pp. 294-297).—It is stated that repeated experiments with a 3-salt nutrient solution under different conditions have confirmed the claims put forth by Shive (E. S. R., 34, p. 333; 36, p. 328) in regard to the value of such a solution and have established its complete sufficiency when used in place of a solution employing 4, 5, or 6 salts. The various ratios which are found to give approximate physiological balance, though differing somewhat, are found to lie within a restricted region. Apparently, optimum ratio or physiological balance tends toward a more efficient absorption.

A study of extracts from a fertile soil as compared with those from an infertile one appears to show that such a study of soil extracts may indicate the chemical needs of a given soil. Further data are to be presented on this work.

Mineral food requirements of the wheat plant at different stages of its development, A. G. McCALL and P. E. RICHARDS (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 3, pp. 127-134, pls. 2, figs. 2).—Work done by McCall, as previously noted (E. S. R., 39, p. 28), has been extended to cover three stages in the development of the wheat plant, namely, the first 30 days, the second 30 days, and the remainder of the time after this to the maturity of the plant. The salts employed in the nutrient solutions were monopotassium phosphate, calcium nitrate, and magnesium sulphate combined in 36 different proportions and applied throughout the growth period for each of the three series.

For the first growth period, the solutions giving the highest yield of tops are characterized by a high calcium nitrate content and a low content of magnesium sulphate, the lowest yield of tops being associated with low calcium nitrate and high magnesium sulphate content. For this period, the effect of the monopotassium phosphate appears to have been almost entirely masked by that of the other components. The mineral food requirements of the wheat plant during the second period appeared to be substantially the same as those for the first period. For the third period, the solutions giving the highest yielding plants are those having relatively high concentration of calcium nitrate and a low proportion of magnesium sulphate and of monopotassium phosphate, the solution producing low yields being characterized by a high proportion of monopotassium phosphate without regard to the ratio of the other two salts.

Evaporation curves for sugar cane, J. KULPER (KUYPER) (*Arch. Suiker-indus. Nederland. Indië*, 25 (1917), No. 18, pp. 812-821, figs. 32; *Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser.*, No. 7 (1917), pp. 10, figs. 32).—Having continued the studies reported previously (E. S. R., 35, p. 331) on the relation of cane variety to evaporation, the author here presents for each of 32 varieties named the curve for transpiration as observed to occur between 7 a. m. and 3.30 p. m. It is always greater, usually much greater, before noon

than afterwards. A few varieties have a high maximum before 11 or even before 10 o'clock. The work was done with plants cut away from their roots and placed in water.

The dependence of the assimilation process in sugar cane upon external conditions, J. KUIJPER (KUYPER) (*Arch. Suikerindus. Nederland. Indië*, 25 (1917), No. 39, pp. 1523-1549, figs. 2; *Meded. Proefstat. Java-Suikerindus., Landbouw. Ser.*, No. 13 (1917), pp. 27, figs. 2).—The author reports in tabular form, with discussion, further data from this work (*E. S. R.*, 35, p. 330), which is still in progress.

Hydrocyanic acid in plants.—III, Some new cyanogenetic plants, J. M. PETRIE (*Proc. Linn. Soc. N. S. Wales*, 42 (1917), pt. 1, pp. 113-117).—Newly found cyanogenetic plants (*E. S. R.*, 31, p. 520) as here listed include five native and seven introduced species, some of which are discussed with regard to the distribution of hydrocyanic acid in the plant body.

Chondriosomes and the primordia of chloroplasts and leucoplasts, D. M. MOTTIER (*Ann. Bot. [London]*, 32 (1918), No. 125, pp. 91-114, pl. 1).—The author describes the methods and means devised and employed by himself in the study of the bodies discussed by various authors under the general term chondriosomes and gives his results, with discussion, including the literature of the subject.

He states that leucoplasts and chloroplasts are probably derived from granular or rod-shaped primordia, which are morphologically alike and which are permanent organs of the cell. These primordia multiply by division, as do also the chloroplasts. In the cells of *Anthoceros*, *Marchantia*, and *Pinus*, and in the tissues of other higher plants mentioned, there are present in the groundwork of the cytoplasm granular and rod-shaped bodies which do not give rise to either chloroplasts or leucoplasts, and to these the name chondriosome is restricted by the author. These bodies multiply by division and are permanent organs in the cell. Like the primordia of leucoplasts and chloroplasts, the chondriosomes are concerned in the transmission of certain hereditary characteristics. The function of the chondriosomes, which are probably connected with some processes of metabolism, can not at the present time be definitely formulated.

A study of the relations between plant growth and combined nitrogen in Winona Lake, T. B. RICE (*Proc. Ind. Acad. Sci.*, 1916, pp. 333-362, figs. 16).—In this report of work, begun in 1915, an account is given of the effect of vegetation upon the nitrogen content of the water, also an account of the effect of the nitrogen content upon plant growth.

The growth of plants reduces the amounts of nitrates and nitrites, especially where the current is inhibited, this reduction being most marked in July. In winter the content of nitrates rises, while that of nitrites falls almost to zero. Both are found to rise rapidly in April, May, and early June, but both are very low after July in regions of dense vegetation. The nitrates may be formed from more complex compounds if these are present in sufficient abundance. Simple nitrogen compounds are formed by oxidation processes from the albuminoid and ammonia content of the water, which may be greatly varied in amount by stirring. Plants can flourish in water very poor in nitrates and nitrites, provided the conditions for their production are present. Sewage discharge into the water favors plant growth, supposedly on account of the availability of its nitrogen content.

The action of certain microorganisms upon the number of bacteria in the soil, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales*, 42 (1917), pt. 1, pp. 162-166).—This is a brief account of the action of certain microorganisms upon the number of bacteria in the soil. The question is raised as to the possible

significance of the toxicity of these microorganisms in connection with a limiting factor in soils.

Additions to Ceylon fungi, T. PETCH (*Ann. Roy. Bot. Gard. Peradeniya*, 6 (1917), No. 3, pp. 195-256).—The partly descriptive list here given contains names of fungi collected in Ceylon during recent years. Some of these are said to have been recorded previously in various journals and reports and to be included here for convenience of reference. Many are noted as new species and a number are of economic importance.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from April 1 to June 30, 1915 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 43* (1918), pp. 106, pls. 6).—This is a record of new or little-known seeds and plants secured mostly from abroad during the period from April 1 to June 30, 1915, about 500 numbers having been procured. The most extensive collections were those made by the Department's explorer, F. N. Meyer, in the Province of Kansu, in northwestern China.

FIELD CROPS.

[Report of field crops work in Idaho in 1917], G. S. RAY and H. W. HULBERT (*Idaho Sta. Bul. 104* (1918), pp. 29-32, 37, 38, 44-49).—In continuation of work previously noted (*E. S. R.*, 37, p. 29), the cropping season of 1916-17 is described as much more unfavorable than the preceding season, and all winter grain in the variety tests winterkilled. Three plats of Turkey Red wheat, previously cropped to peas, produced at the rate of 27.7 bu. per acre. The leading varieties of small grains and their respective yields were as follows: Jenkins Club, Palouse Bluestem, Little Club, and Early Baart spring wheats with 28.6, 27.1, 26.5, and 25.6 bu. per acre; Banner, Swedish Select, Big Four, and Abundance oats with 65.4, 62, 62, and 61.5 bu. per acre; and Oderbrucker and Beardless barley with 51.2 and 40.7 bu. per acre. Spring rye yielded at the rate of 13.4 bu., and spring emmer at the rate of 13.3 bu. per acre.

Mixtures of peas and oats, peas and wheat, and peas and barley sown at various rates were grown for hay. A mixture of Blue Prussian peas and Swedish Select oats, each sown at the rate of 1.5 bu. per acre, with an average yield of 1.9 tons of cured hay per acre, was deemed best. Seedings of various grasses, alfalfas, and clovers, and of mixtures of the same have produced yields of cured hay ranging from 1.53 tons per acre for timothy to 3.62 tons for white sweet clover. The highest-yielding mixture consisted of 8 lbs. brome grass, 12 lbs. orchard grass, and 6 lbs. red clover per acre, and yielded 3.33 tons per acre of cured hay.

Of 14 varieties of field peas, Kaiser with 22.5 bu. per acre, Bluebell with 21.6 bu., and White Canada with 20.2 bu. were highest. Blue Prussian, Bluebell, Alaska, White Canada, White Colorado, and White Marrowfat are especially recommended, due to their average yields for several seasons. Based on the results of tests of cultural methods made during the past four years the following recommendations are deemed appropriate: Early seeding, 2.5 to 4.5 in. deep at a rate of from 90 to 110 lbs. of seed per acre, and drilling rather than broadcasting or seeding in rows.

White Navy, Refugee, and Lady Washington beans grown in hills yielded at the rate of 21.7, 19.5, and 17 bu. per acre, respectively, and in drills, 17.7, 18.2, and 13.9 bu., respectively.

In tests with different varieties of corn for silage, the highest yields were obtained from King Philip, a flint variety; Minnesota 13; and Pride of the North, with 12, 11.2, and 10.3 tons per acre, respectively. Minnesota 13 is

claimed, however, to show the higher production of ears. Rustler, a white dent corn, has matured seed.

Yields ranging from 4.9 to 13.3 tons per acre were obtained from carrots, rutabagas, and mangels.

In nursery work with small grains, the most promising oat varieties included Golden Beauty, Abundance, White Bonanza, Big Four, Victory, and Danish Giant.

The progress of fertilizer and rotation experiments on Palouse silt loam soil at Moscow is also briefly noted. In a rotation of wheat, oats, and potatoes, the average yield of all plats in 1915 with nitrate of soda amounted to 30.2, 82.2, and 125 bu. per acre, respectively, as compared with yields from the same crops grown without fertilizer of 23.6, 59, and 99.8 bu., respectively. Applications of phosphorus and potassium are stated to have shown no appreciable difference in yield from the check plats. Wheat grown continuously without either manure or fertilizer yielded at the rate of 8.8 bu., and with manure at the rate of 17.4 bu. Wheat after fallow yielded 23.5 bu. per acre, after peas 24 bu., after corn 23.1 bu., and after potatoes 27.7 bu., indicating that various crops can be substituted for fallow to good advantage. Wheat grown on a plat yielding 3.2 tons of clover hay in 1916 produced 16.9 bu. per acre in 1917, as compared with an average yield for all other plats of 11.5 bu.

Field crops work on the Caldwell, Jerome, and Sandpoint substations is also briefly noted, and includes variety tests of cereal and forage crops and, at Jerome, the testing of various kinds of seed potatoes. At Sandpoint, Clydesdale, a medium-maturing oat variety, Kerches, a late variety, and Early Mountain gave respective yields of 41.6, 31.2, and 26.9 bu. per acre. The average yield of seven $\frac{1}{2}$ -acre plats of wheat was 42.7 lbs. for 1915, 50.4 lbs. for 1916, and 73.8 lbs. for 1917, while a plat sown to clover in 1916 produced 101 lbs. of wheat in 1917.

[Report of the field crops work on the Aberdeen substation], L. C. AICHER (*Idaho Sta. Bul.* 104 (1918), pp. 39-43).—This reports a continuation of work previously noted (E. S. R., 37, p. 30), including tests on dry land, with varieties of winter and spring wheat, different rates of seeding wheat, and the production of peas, sugar beets, and alfalfa for seed, and on irrigated land, variety tests with wheat, barley, oats, flax, and peas; the growing of alfalfa, clover, and sugar beets for seed; and tests with potatoes. Turkey winter wheat and Early Baart spring wheat are deemed the best dry-land varieties, and Dicklow best for irrigated land.

[Experiments with field crops in Maine], C. D. WOODS (*Maine Sta. Bul.* 269 (1918), pp. 16, 31-43).—Variety tests with oats at Highmoor Farm, fertilizer tests with oats and potatoes at Highmoor and Aroostook Farm, and plant breeding work with oats, wheat, and timothy at Aroostook were continued during 1917 as heretofore (E. S. R., 37, p. 635).

The season was unfavorable for even stands and high yields of oats. Early Pearl with 58.3 bu. and Minnesota No. 26 with 55.8 bu. per acre were highest of the commercial varieties tested. Maine Nos. 1687, 1741, and 1479, with respective yields of 69, 66.5, and 64 bu., were the highest-yielding varieties. Maine No. 340, a leading variety in favorable seasons, yielded only 49.7 bu.

Experiments to study the effect of omitting potash fertilization on oats were conducted on both farms, and the results obtained at Aroostook are said to indicate that potash is not a limiting factor in growing the crop. The stands at Highmoor were too uneven to warrant conclusions.

Field tests on the effect of omitting potash fertilization upon potatoes at Aroostook have been continued for three seasons, and the following tentative conclusions reached: The addition of 300 lbs. of common salt per acre resulted

in a small but uniform increase in yield; the addition of 45 lbs. of potash per acre gave a uniform and profitable increase, nothing being gained by larger applications; good yields were also obtained without potash, other experiments (see p. 327) indicating that nitrogen may be the limiting factor.

Observations on the potato crop in relation to soil type and to fertilizer treatments, made on 4 fields of Caribou loam soil situated near each other in the Aroostook Valley and following the same general outline as the experiments noted above, were not deemed conclusive but are said to indicate different values for each field.

Experiments with potatoes receiving different forms of nitrogen have been in progress for 4 years. The results are held to indicate that there is little choice in the form of nitrogen to be used on potatoes in Aroostook County.

Report of the division of farm crops, J. F. Cox (*Michigan Sta. Rpt. 1917, pp. 325-336, figs. 3*).—This reports the progress of work along the same general lines as that previously noted (E. S. R., 36, p. 734), including a brief account by F. A. Spragg on the relative distribution and value in the State of Worthy oats, Red Rock wheat, and Rosen rye.

The results obtained in rotation and manure experiments for the period 1911 to 1916, inclusive, and for fertilizer tests made during the period of 1911 to 1915 are reviewed by V. M. Shoesmith. The maximum net increase per rotation of corn, wheat, and clover was obtained from the use of a complete fertilizer applied to the wheat and amounted to \$13.51, while an application of acid phosphate and muriate of potash was next highest with a net increase of \$12.79. The highest yields of corn following fertilized wheat were also obtained after these treatments and amounted to 43.6 and 42.4 bu. per acre, respectively, for the 4 years 1913 to 1916, inclusive, as compared with 35 bu. for the untreated checks.

The highest yield of corn in manure experiments in which the manure was applied to the corn in a corn, wheat, and clover rotation followed an application of 10 tons of stall manure and amounted to 49.2 bu. per acre, with an application of 5 tons stall manure and 200 lbs. acid phosphate the yield was 48.7 bu. Clover grown the second year after the manured corn produced a maximum yield of 2.37 and 2.35 tons per acre for the two treatments, respectively. Yard and stall manure applied at the rate of 5 tons per acre were valued at \$3.25 and \$3.81 per ton, respectively, and stall manure applied at the rate of 10 tons per acre was valued at \$3.43 per ton. Reinforced with acid phosphate, stall manure produced a sufficient increase to place a value of \$7 per ton on the manure after paying for the acid phosphate. The net value of manure treated with rock phosphate was estimated to be \$4.68 per ton.

Data are presented showing the yields and estimated values of different crops grown continuously and in rotation.

[Report of field crops work in Minnesota], A. Boss (*Minnesota Sta. Rpt. 1917, pp. 42, 43*).—This reports the results of variety, rotation, and tillage experiments with field crops for the year ended June 30, 1917, along lines similar to those previously noted (E. S. R., 37, p. 226).

In summarizing the results of 6 years' work with various crops grown in different rotations, the following points have been noted: Grain and corn grown continuously with 6 tons of manure applied once in 3 years showed a decided lowering of yields. In a rotation of oats, wheat, clover, and corn with manure applied as above, corn showed an increase in yield of 13.7 per cent, oats 14.95 per cent, and wheat 30.98 per cent, as compared with the same crops grown continuously. On the basis of net income per acre, crops grown in a 4-year rotation showed an increase over those grown continuously of 29.2 per cent for corn, 35.2 per cent for oats, and 72.3 per cent for wheat. Applications of com-

mercial fertilizers with or without manure did not appreciably increase yields, and were made at a loss.

In forage-crop investigations the results of 2 years' trials with soy beans grown alone and in mixture with corn are said to indicate that the combination yields more protein and total nutrients per acre than either crop grown alone. Further tests with alfalfa confirm previous work showing that inoculation and liming are essential to a good stand and a maximum yield. Proso and foxtail millets have outyielded Sudan grass and Japanese millet. The best yields of sweet clover have been obtained with a nurse crop. White sweet clover has given an average yield of 2.14 tons per acre, as compared with 1.82 tons for the yellow sort. Peas and oats grown for hay yielded at the rate of 2.15 tons per acre, as compared with 3.5 tons for clover. In tests with different root crops, sugar beets have given the best yield of dry matter, protein, and total nutrients per acre, with mangels next.

[Report of field crops work at the Crookston substation, 1916], C. G. SELVIG (*Minnesota Sta. Rpt. 1917*, pp. 68-73).—This reports the progress of work previously noted (*E. S. R.*, 37, p. 226). Weather conditions in the early spring and during the growing season were rather unfavorable to crop production.

In rate-of-seeding tests with oats the highest yield, 27.9 bu. per acre, was obtained from both an 8 and a 10 pk. rate. An 8-pk. rate gave the best results with barley.

Winter wheat sown on corn left uncut yielded highest, followed by seedings on corn with every sixth row uncut, and by seedings on corn stubble covered with 1 ton of straw per acre. The use of straw for winter covering is said to give promising results.

Land dynamited and plowed to the ordinary depth produced the highest yield of corn silage in subsolling tests. No appreciable advantage was observable for horse disking and plowing over engine disking and plowing.

Sixty Day, Kherson, Minnesota No. 295, and Swedish Victory were the only oat varieties to yield more than 30 bu. per acre, while only three varieties of barley, Mahrliche No. 912, Oderbrucker, and Odessa, produced more than 35 bu. per acre. Minnesota No. 951 durum wheat was highest with 16.6 bu., followed by Kubanka with 12.7 bu. The rust-resistant hybrids are said to have compared favorably with standard varieties during 1915 and 1916.

Southern German millet yielded 9,077 lbs. per acre in 1916, with a 4-year average yield of 7,394 lbs. Field peas yielded at the rate of 3,100 lbs. of fodder and 13 bu. of grain per acre. Early Amber cane produced over 5 tons per acre, Sudan grass 7,454 lbs., and Manchu soy beans 3½ tons. Meadow fescue gave the highest yield in variety tests with different grasses and combination of grasses and legumes. The next best yield was obtained from a mixture of *Bromus inermis*, meadow oat grass, white clover, and alfalfa. Northwestern Dent corn continued to give the highest yield of grain, while Bocaria was highest in yield of fodder.

Flax from a home-grown strain produced 398 lbs. of scutched fiber per acre and from a Holland strain, 363 lbs.

In crop rotation tests wheat grown continuously with 6 lbs. of clover gave the lowest average yield, 14.41 bu. per acre, while continuous wheat alone yielded 16.25 bu.

Mammoth Golden Giant with 19.37 tons per acre, Giant Red Eckendorf with 20.6 tons, and Yellow Globe with 25 tons were the highest yielding mangel varieties. Prize-winner rutabagas, Cowhorn turnips, and Mastodon carrots produced maximum yields of 325, 375, and 415 bu. per acre, respectively.

Irish Cobbler with 166.6 bu. per acre was the highest yielding potato variety, followed by Carmen No. 3 with 158.9 bu. Seed potatoes treated with corrosive sublimate produced 170.5 bu., as compared with 108.8 bu. from untreated seed. Spraying three times with Bordeaux mixture resulted in a yield of 116 bu., as against 87.3 bu. where no spraying was done. The Bordeaux plots outyielded those areas treated with commercial lime-sulphur and self-boiled lime-sulphur. In tests of insecticides to control the Colorado potato beetle, liquid Paris green gave the highest mortality of beetles at the lowest cost per acre. Medium-sized whole seed potatoes gave the highest yield, 132 bu., and small-sized whole potatoes gave 126.4 bu., with the highest three-year average, 145.23 bu. A planting rate of 16 bu. per acre is said to have given the best results for the last two years. Hill selection of seed is deemed best, having yielded 156 bu. per acre in 1916. Cellar-selected seed was found to be far superior to field-run and run-out seed.

[Report of field crops work at the Grand Rapids substation, 1916], O. I. BERGH (*Minnesota Sta. Rpt. 1917*, pp. 79, 80).—This briefly reports the progress of work previously noted (E. S. R., 37, p. 228). The weather conditions are described as rather unfavorable to the small grains, but favorable to corn and potatoes.

Maximum yields of cereals grown in variety tests were obtained as follows: Ten bu. per acre for Minnesota No. 951 Macaroni wheat, 9.2 bu. for Prelude spring wheat, 16.25 bu. for Blue Ribbon 6-rowed barley, 21.8 bu. for Austrian Hanna 2-rowed barley, 61.9 bu. for Kherson oats (early), and 61.2 bu. for Banner oats (late).

Corn for silage produced from 8 to 10 tons per acre, while both Minnesota Nos. 23 and 13 ripened some grain. Potato yields ranged from 131.8 to 231.8 bu. per acre, Green Mountain being the highest yielding variety. Clover and timothy for hay produced from 1.9 to 2.9 tons per acre at the first cutting, and alfalfa produced 3.19 tons for two cuttings. The best average yield of alfalfa was obtained from northern-grown seed (Crookston), which produced 3.91 tons.

[Report of field crops work in North Carolina, 1917], C. B. WILLIAMS (*North Carolina Sta. Rpt. 1917*, pp. 24-27).—This reports the testing and improvement of varieties and strains of cotton, corn (E. S. R., 38, p. 532), soy beans, cowpeas, peanuts, and small grains, including oats, wheat, and rye, in continuation of similar work previously noted (E. S. R., 37, p. 636).

In selection work with cotton, strains resembling Cook, Cleveland, Culpeper, and Toole have been isolated from the original King Improved type. The lack of uniformity and poor yield in ordinary varieties of cotton is thought to be due in part to mixtures of characters, such as short lint, poor yield, lateness, etc., which are heritable, but may be eliminated by careful selection.

Varieties of cereals were tested at various points in the State for yields of both seed and hay, and the varieties of wheat and oats best suited for each section indicated. Abruzzi rye compared with common winter rye, obtained from different sources, in all cases produced earlier and more material for early spring pasture, matured grain earlier, and yielded from 2 to 6 bu. more per acre.

The highest yielding varieties of peanuts were Virginia, North Carolina, Improved Spanish, Virginia Bunch, Small Spanish, Jumbo, and Valencia. The percentage of kernels ranged from 66.8 per cent for Jumbo to 78 per cent for Small Spanish, while the percentage of so-called "pops" ranged from 1.1 per cent for Virginia Bunch to 8.8 per cent for North Carolina.

[Report of field crops work in South Dakota], N. E. HANSEN (*South Dakota Sta. Rpt. 1917*, pp. 35-38).—Brief descriptions are given of two hybrid alfalfas and one white-flowered selection propagated by the author's machine method of

transplanting (E. S. R., 35, p. 830) and offered for distribution in 1917. Seeds of the following briefly-described forage plants were also distributed: Siberian white sweet clover, Siberian red clover, Daghestan yellow sweet clover, Hansen Samara perennial clover, and Semipalatinsk alfalfa.

Kale, marrow cabbage, and Dwarf Essex rape, E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 6 (1918), No. 2, pp. 22-24).—Brief directions are given for growing these crops for forage.

[Observations on legume inoculation], C. G. NOBLES (*Michigan Sta. Rpt.* 1917, pp. 289-291).—A brief report is presented on the distribution of pure cultures of legume bacteria for inoculation and on the isolation of *Pseudomonas radicicola* from alfalfa, clover, peas, beans, soy beans, and vetch.

Information obtained from a questionnaire sent to each of the experiment stations in United States is summarized in tabular form. The points covered included the extent of the practice of inoculation, the legumes which require inoculation and those for which it is deemed unnecessary, methods of inoculation (soil or pure cultures), the supplying of pure cultures, the estimated success of inoculation, the desirability of encouraging the practice of inoculation by pure culture, the reliability of commercial cultures, the advisability of subsequent inoculations, extension work with inoculation, and publications dealing with the subject. No investigational work was reported that specified the need of inoculation for any legume except alfalfa. Although methods of seed and soil treatment have been devised, a large part of the material on the subject is deemed to be a matter of opinion so far as the application of the practice to farm conditions is concerned. Alfalfa was more commonly treated than any other legume, and the soil and pure culture methods of treatment were used about equally.

A total of 224 reports on the effect of pure cultures distributed during 1914, 1915, and 1916 are reviewed, but definite conclusions are not deemed justified. The reports indicated, however, that pure cultures for alfalfa were highly successful; that no conclusion can be reached regarding the value of inoculation of legumes other than alfalfa; that no definite statement can be made concerning the influence of liming, date of seeding, or nurse crop on inoculation; and that the presence of organic matter favors success with inoculation.

The relation of nitrates to nodule formation, T. L. HILLS and J. J. PUTNAM (*Idaho Sta. Bul.* 104 (1918), pp. 18, 19).—Cultures of the alfalfa and red clover strains of nodule bacteria were grown on mannite agar slopes and in thin layers of mannite solution containing from 5 to 100 mg. of nitrogen as nitrate per 100 cc. of the medium. Potassium, sodium, calcium, and magnesium nitrates were used. The cultures were incubated at from 25 to 28° C., and small quantities were removed every two weeks for 16 weeks and used as inoculant for seeds of the respective legumes growing under sterile conditions in soft mannite agar. After 5 weeks the seedlings were examined for nodules.

The results are said to indicate that the nitrates did not appreciably reduce the infecting power of the alfalfa strain, except in the case of the highest concentration of magnesium nitrate after 16 weeks. The higher concentrations (above 10 mg. of nitrogen per 100 cc. of medium) did appear to exert a marked influence on the red clover organism.

Irrigation of alfalfa in Nevada, C. S. KNIGHT (*Nevada Sta. Bul.* 93 (1918), pp. 18, figs. 10).—The experimental work discussed in this bulletin has been noted from another source (E. S. R., 39, p. 132).

Miscellaneous experiments with corn, B. L. HARTWELL and S. C. DAMON (*Rhode Island Sta. Bul.* 173 (1918), pp. 2-27).—Data have been accumulated from different corn experiments conducted in Rhode Island during a long period of years, including variety tests, hybridization studies, rate-of-planting tests,

comparisons of light and heavy kernels, and observations of the effect of soil fertility upon the yield and composition of corn. The results are not deemed sufficiently conclusive to warrant separate publication. Most of the work was done with Rhode Island White Cap flint corn planted in rows 3 ft. apart with the hills generally 3 ft. apart in the row and with about 5 kernels per hill.

The native variety of flint corn is said to be fully as well adapted to local conditions as any variety tested. Crossing different strains of White Cap did not result in any marked advantage, with the exception of a strain from a section of the State having a longer growing season which yielded more stover. This character influenced its crosses with other strains.

No consistent differences in yield were observed whether corn was planted in hills or drills at the same rate of seeding. Under favorable crop conditions increased yields tended to follow high rates of seeding (6 kernels every 3 ft.), whereas under unfavorable conditions 3 kernels produced as much as a larger number. The higher seeding rates were generally accompanied by a decreased number of hard ears per stalk and by a reduction in the weight of the ears, although these tendencies were not transmitted to the next crop. Light-weight kernels produced on the average 81.1 bu. of hard ears, and heavy kernels produced 87.4 bu. Yields of stover amounted to 4.4 and 4.78 tons per acre, respectively.

An increase in the amount of available nitrogen resulted in both a larger number and in heavier ears. These tendencies were not transmitted to the following crop.

A maximum yield of 102 bu. of crib-cured corn containing 84 per cent kernels was secured in competitions in acre yields of ear corn.

In soil fertility tests phosphorus was found to be the limiting factor for corn, except after an application of slaked lime, when for 4 years the maximum growth was made without phosphorus, provided nitrogen and potassium, which were then the limiting factors, were applied. Determinations of phosphorus in the crops produced after liming failed to show whether nitrate of soda or muriate of potash was most effective in increasing the availability and absorption of phosphorus.

Corn grown continuously for over 20 years without manure but with annual applications of moderate amounts of fertilizer chemicals has produced very low yields, regardless of whether rye or no cover crop was planted each year at the last cultivation of the corn, although fair yields were maintained when legumes were used as a cover crop. Pot experiments conducted with an optimum amount of water showed nitrogen to be the only limiting factor. Less total nitrogen was found in the soil where the rye and where no cover crop had been used than in that where a legume cover crop was plowed under each year, the latter area also containing the most organic matter. The lack of nitrogen appeared to prevent the organic matter introduced in the rye from exerting much influence on the corn yield.

Outline of a plan for corn breeding, L. H. SMITH (*Illinois Sta. Circ. 221* (1918), pp. 4).—The author presents in outline form a plan for corn breeding work. The fundamental points to be followed in the selection of the foundation stock and in the preliminary ear-row tests are noted, and two methods of procedure are indicated, one being described as mass selection and recommended primarily for the farmer, and the other, pedigree selection, designed for the plant breeder.

Ear-type selection and yield in corn, P. J. OLSON, C. P. BULL, and H. K. HAYES (*Minnesota Sta. Bul. 174* (1918), pp. 3-60, figs. 9).—Investigations conducted on the university farm and on outlying substations extending over a period of years are described, embracing a series of breeding experiments with

Minnesota Nos. 13, 161, and 332 corn in an effort to effect a general improvement by ear-to-row selection of certain varieties and to determine the relation between certain ear types and yield.

In the ear-to-row tests a large number of ears were selected each year from the highest-yielding rows and were carefully scored in the laboratory on the basis of the usual corn score card. About 36 of the highest-scoring ears were employed for each succeeding year's ear-to-row planting. The value of this intensive selection was studied by grouping the ears in classes according to their scores for such characters as length, weight, shelling percentage, circumference, butts, tips, kernel uniformity, and variety character, and by noting the comparative average yields of these groups. The yields were found to be remarkably close in every case.

Additional tests were made on the university farm in which the correlation coefficients were determined for each character. It was concluded that statistical significance could be attached to an indication of correlation in only three cases, namely, total score, shelling percentage, and length, their respective correlation coefficients being 3, 3.5, and 2.5 times the probable error. A further comparison between the yield of the "upper third" group of total score ears and the highest-yielding third group for each of the characters studied showed that the highest-scoring ears become only average. All indications of correlation found in the investigations are deemed to be of doubtful statistical and of no practical significance.

Ears of corn were selected from a crib of Minnesota No. 13 representing such definite types as show small, thick, elongated, poor and good tips, poor and good butts, and tapering, and each type was planted separately. The selection was not continuous. A comparison of the results for different years of the experiment showed no consistent relation between type and yield.

In connection with the ear-to-row tests noted above a plat of Minnesota No. 161 was maintained in which the ears were selected continuously on the basis of ear character only. The ear-to-row method outyielded the exclusive ear-selection method by 5.6 bu.

All data are presented in tabular form, and the results are fully discussed. In conclusion the authors state that "reduced yields accompanying inbreeding are, according to the best genetic evidence, a direct result of increased gametic purity. . . . Continued selection to a type, therefore, may be expected to tend toward the same reduction in yield. The reduction will take place much less rapidly than under artificial self-fertilization, because the approach to purity will be much less rapid. . . .

"The results presented in this paper show conclusively that close selection for high-scoring ears is of no practical value in increasing yield. The selection of high-yielding ears as determined by the ear-to-row method proved to be of considerable value as a means of increasing yield. Whether selection for yield plus selection for type will give as high a yield as selection for yield alone is not known. Close selection for any particular set of characters, we believe, tends to reduce yield if such selection succeeds in producing a uniform type. As evidence of results having been obtained, the Illinois selection for high and low protein and high and low oil may be given (E. S. R., 20, p. 531). . . .

"From the standpoint of a close approach to a score-card type, the breeder must determine the particular value of such approach for himself. The results of all experiments would surely tend to show that such score-card selection might tend to a reduction in yield if long continued and if no new blood were introduced. A broad system of breeding for corn would seem, therefore, to be the correct procedure. Such a method [described by Montgomery (E. S. R., 22, p. 444)] is here given."

Nurse planting select cotton seed, P. V. CARDON (*U. S. Dept. Agr. Bul. 668 (1918), pp. 12, figs. 4*).—This bulletin presents a discussion of observations made at San Antonio, Tex., in 1917 to determine whether the usual methods of increasing select stocks of cotton seed gave as good results as could be obtained where other kinds of seed supplied the lifting force necessary to break the soil crust. The nurse plantings included types of cotton easily distinguished from the select stock, also peas and beans. The advantages of delinted seed cotton for nurse planting are noted, and methods of planting in hills and drills with hand and mechanical corn planters are described.

The usual methods of increasing select seed are said to necessitate the destruction of from 50 to 75 per cent of the seedlings in thinning out the heavy stands and to require 3 or more years to obtain a sufficient quantity. Substituting other seeds for the surplus cotton seed led to the removal of only from 7 to 25 per cent of the cotton plants in thinning, and resulted in an increase of from 30 to 60 per cent in the acreage planted each year. This effected a saving in time of from 1 to 3 years in the production of sufficient quantities of seed.

Growing the fall or second crop of potatoes in California, S. S. ROGERS (*California Sta. Circ. 200 (1918), pp. 4*).—Brief directions are given for growing the crop. Seed potatoes maturing in the spring are said to be more desirable for fall seeding than those kept through the winter. The importance of planting only on suitable soil and where adequate irrigation is available is emphasized.

Potato culture in Colorado, E. P. SANDSTEN (*Colorado Sta. Bul. 243 (1918), pp. 3-35, figs. 14*).—This gives a rather detailed description of the cultural methods and field practices employed in growing the crop in Colorado, together with a brief discussion of varieties and on grading potatoes, seed certification, and storage. Potato diseases occurring in the State and preventive measures are noted.

Potato culture in South Dakota, M. CHAMPLIN and G. WINRIGHT (*South Dakota Sta. Bul. 176 (1917), pp. 696-764, figs. 50*).—This bulletin describes cultural methods and field practices deemed best for growing potatoes in the State, together with a discussion of the cost of production, of methods of storing and marketing, and of insect enemies. Potato production is said to have increased 120.8 per cent from 1906 to 1915. Brief descriptions of adapted varieties are included, and data are presented showing the results of variety tests for both quality and yield.

Acme and White Harvest, extra early strains, were found to do best at Cottonwood, while Irish Cobbler and Eureka, medium early varieties, were best at Brookings, Highmore, and Eureka. At Brookings, Raleigh, Bugless, and Late Rose, all late varieties, gave satisfactory returns. Irish Cobbler and Early Ohio are deemed best for general use throughout the State, while Acme has given the best results for early market.

Planting two fair-sized seed pieces per hill, with hills 42 in. apart each way, to make possible cross cultivation, is recommended for large scale plantings.

Studies on the morphology of wheat, G. H. JENSEN (*Washington Sta. Bul. 150 (1918), pp. 3-31, figs. 75*).—The author discusses the results of certain morphological studies with wheat, including observations on the development of the spike and flower, the development of the microspore and male gametophyte, the development of the megaspore and female gametophyte, fertilization and early embryonic development, and endosperm development.

Bluestem, Marquis, and hybrid 143 were used for purposes of comparison and were planted in 10-in. pots in the greenhouse on three successive dates

(January 22, February 17, and March 20, 1915). Dissections of the stem were begun about April 1, and material was collected at varying intervals from that time until June 20, when many kernels of the first and second plantings had thoroughly ripened. All subsequent observations were made upon fall-sown Little Club collected from a field plat in the rotation and cultural experiments on the experiment station farm. It is stated that no important morphological differences were observed in any of the varieties studied.

A list of 40 titles, comprising the literature cited, is appended.

Performance records of some eastern wheats in Idaho, J. S. JONES and C. W. COLVER (*Idaho Sta. Bul. 103 (1918), pp. 3-32, figs. 9*).—Experimental work begun in 1907 is described in which varieties of hard red wheat were obtained from northern and middle-western States for growth in Idaho under widely varying conditions of soil and climate to study their effect upon the yields and upon the milling and baking qualities of the grain. The varieties chosen included Turkey Red from Fort Hays, Kans., North Platte, Nebr., and Genesee, Idaho, and Minnesota Bluestem and Glyndon Fife from the Minnesota Experiment Station. The Turkey Red strains were grown at Moscow and on the Aberdeen and Clagstone substations, and Bluestem and Fife at Moscow and on the Aberdeen and Gooding substations. Data on the yields and on the composition of the wheat and flour are presented in tabular form, and the relative percentages of protein of the three strains of Turkey Red and of the two spring wheats are depicted graphically for each experimental center. The authors summarize their results as follows:

"The Turkey Red variety from whatever source secured proved to be highly satisfactory wherever grown from the standpoint of yield in comparison with varieties of the white class. Excepting the crops grown on the dry farm at Aberdeen, the hard red spring varieties proved to be very satisfactory, too, from the standpoint of yield. It is doubtful, however, if the varieties chosen for this work are the equal of some of the well-known varieties of the white class in capacity for yield.

Of the Turkey Red samples returned each year for analytical and milling work, those from the dry farm at Aberdeen were much the richest of all in protein. They averaged higher in protein for four years than did samples of the same variety representing three crops grown at Fort Hays, Kans., and North Platte, Nebr. Turkey Red grown on the station at Aberdeen with irrigation reached a high level of protein with the crop of 1916 under conditions of growth which point to an intimate connection between the soil's content of available nitrogen and the power of protein elaboration on the part of the wheat plant. A low-protein content need not be characteristic of the Turkey Red variety under irrigation.

"The protein of the hard red spring varieties grown on the station farm at Moscow varied widely from year to year, but the average for eight years was but slightly less than that of the original Minnesota-grown seed. Protein reached its highest level in the hard red spring varieties in crops grown on the dry farm at Aberdeen. Protein was maintained at a high level in all crops of the hard red spring varieties grown with irrigation. Samples returned from the crops grown at Aberdeen in 1914 and in 1915 were practically identical in protein with the original Minnesota-grown seed and with crops of the same years grown in Minnesota. In 1916 the irrigated crop at Aberdeen substantially exceeded the Minnesota-grown crop of that year in protein. At no time did the protein of the crops grown on the station at Gooding fall to the level of that of the original Minnesota-grown seed. In 1914 and again in 1916 it substantially exceeded the protein in the Minnesota-grown wheats of the same years

and approached rather closely the extremely high protein content of the crops grown at Aberdeen under dry-farm conditions.

"Hard red spring wheats of the highest quality can be grown in south Idaho with irrigation if other conditions of growth are satisfactory. Evidence that conditions which favor the rapid nitrification of soil organic matter also favor the manufacture of protein by the wheat plant is accumulating."

Irrigation of wheat in Nevada, C. S. KNIGHT (*Nevada Sta. Bul. 92 (1918), pp. 23, figs. 14*).—The experimental work described in this bulletin has already been noted from another source (E. S. R., 39, p. 132). Methods of irrigating wheat in the State are briefly outlined, including flooding from field ditches, in borders, and in checks, and furrow irrigation. The use of tractors in preparing land for irrigation is described.

First annual report Colorado seed laboratory, W. W. ROBBINS (*Colorado Sta., Seed Lab. Bul., 1 (1917), No. 2, pp. 28, figs. 3*).—The establishment and equipment of the Colorado seed laboratory is described, and the regulations and methods of procedure adopted by the laboratory for the administration of the seed act with respect to sampling and testing seed for purity and germination are outlined in detail. The results of purity tests made on 237 samples and of germination tests on 228 samples are reported. A list of the most common impurities found in important crop seeds sold in the State is presented, together with a list of 81 weed seeds found in the samples analyzed.

Commercial agricultural seeds, 1917, C. D. WOONS (*Maine Sta. Off. Insp. 86 (1918), pp. 2-27*).—The results of purity tests with seeds in the 1917 inspection are presented in tabular form, together with a list of the weed seeds identified.

Agricultural seed inspected in 1916, C. P. SMITH (*Maryland Sta. Bul. 210 (1918), pp. 19-50*).—The results of purity and germination tests with about 1,150 official samples, including red, mammoth, crimson, and alsike clovers, timothy, redtop, orchard grass, millet, sweet clover, alfalfa, cowpeas, and soy beans, collected during 1916, are reported in tabular form.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1918), No. 9, pp. 8, fig. 1*).—This number includes an outline of the war emergency seed surveys for July 1, 1918, a preliminary report on the growing of onion sets, and a report on vegetable-seed crop conditions in the West. Statistical data are presented showing the amounts, values per pound assigned by importers, and the duties charged for field, vegetable, and flower seeds imported into the United States during the 8-year period ended June 30, 1917. How the seed-importation act has helped the farmer is briefly discussed by E. Brown, and the use of surplus cowpea seed by C. V. Piper.

Seed-market notes and tabulated data on recent imports of forage-plant seeds permitted entry into the United States are presented as usual.

HORTICULTURE.

Report of the division of horticulture, H. J. EUSTACE (*Michigan Sta. Rpt. 1917, pp. 322-324*).—Experiments in spraying raspberries to protect them against anthracnose have yielded favorable results from the use of commercial lime-sulphur (1:20), applied when the bushes are dormant. Comparative tests of several commercial preparations for the spraying of apple orchards have shown that none of these preparations was as satisfactory as the homemade materials or the ordinary commercial lime-sulphur. Many of them were ineffective, caused injury to fruit or foliage, and were hard and disagreeable to prepare. No satisfactory substitutes were found for the Bordeaux mixture sprays in controlling grape diseases. The 4:4:50 formula applied four times was the best of the Bordeaux sprays. A patented peach-tree borer protector

that fitted around the base of the peach tree, with the idea of making it impossible for the borers to work into the trunk, was tested out in a peach orchard. The trees were kept free from borers where the cemented joints of the protectors were not broken open by the growth of the trees, but about one-third of them were broken open in this way, thus affording practically no protection to the tree.

Experiments to determine the value of preserving fruits and vegetables by freezing at a low temperature have shown that nearly all of the smaller fruits, such as cherries, currants, gooseberries, and raspberries, can be preserved very well. Strawberries which had been frozen were not desirable. The quality of sweet corn after freezing was not good. Frozen asparagus when cooked was dark, tough, and strong.

Experiments were conducted to determine what length of time asparagus would remain in wholesome condition when placed in commercial cold storage. Two methods of storage were used. In one the bunches were simply packed in paper-lined boxes or baskets, and in the other the bunches were set in shallow water in pans. In 1915 the asparagus was stored over the ice in an ice house and in the egg room at the Lansing Cold Storage. In 1916 it was stored in the egg room only. The results from this work indicate that asparagus can be held in good condition for at least two weeks if set in water. The most desirable temperature is probably 36 to 38° F., or possibly higher. At this temperature there is no change of any consequence in either weight or length.

Report of the division of horticulture, W. N. HURT (*North Carolina Sta. Rpt. 1917, pp. 68-71*).—A progress report on work with nuts, fruits, and vegetables, conducted mainly at the substations.

Tests of 22 of the most important varieties of pecans have been carried on for 10 years. Of these certain varieties show marked adaptability to North Carolina conditions, while others are proving to be undesirable. The growing season is too short for some varieties; others produce well but fail in the cracking test for quality and utility. Individual tree performance records have shown constant variation in yield and size of nut within the same variety. This indicates the possibility of bud variation in the pecan, and bud selection work has been started. Undesirable varieties have been top-worked with considerable success. By using properly selected buds an average "live" of 85 per cent has been secured by the patch bud method and a "live" of 70 per cent by the slip bark graft method.

The results from the 10-year-old experimental pecan orchards strongly indicate that as a commercial proposition pecan growing should be entirely confined to the coastal plain. The value of such cultural practices as tillage and the use of cover and leguminous crops is shown in the increased size of trees and in the increased size and number of nuts produced as compared with trees and nuts grown in sod.

Among the results from peach projects, here briefly outlined, it is stated that severe pruning causes a prolongation of the rest period in winter, thus enhancing the chance for a successful crop. Thinning peaches has resulted in higher-colored fruit of larger and more uniform size and also appears to increase the vigor and longevity of the tree.

The home vegetable garden, R. A. MCGINTY (*Colorado Sta. Bul. 241 (1918), pp. 3-35*).—A practical treatise on growing, harvesting, and storing the home supply of vegetables, with planting dates based on the approximate dates for planting in the vicinity of Fort Collins, Colo.

The home garden, W. C. EDMUNDSON and J. S. WELCH (*Idaho Sta. Bul. 106 (1918), pp. 3-30, figs. 13*).—A practical treatise on home gardening in Idaho,

including specific directions for the culture of all the more important vegetables and the control of garden pests.

Growing cabbage, cauliflower, and broccoli, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 6 (1918), No. 2, pp. 20-22).—Practical instructions are given for the culture and care of these vegetables, including a list of recommended varieties.

Onion growing in California, S. S. ROGERS (*California Sta. Circ.* 199 (1918), pp. 22, figs. 14).—A treatise on onion growing in California discussing the extent of the industry in the State, cost of production, yields, prices received, cultural requirements, preparation of the soil, the onion as a market garden crop, methods of propagating, planting, transplanting to the field, irrigation, cultivation, breaking down the tops, harvesting, storage, onions as a truck crop, varieties, onion seed production, and crop troubles.

Idaho spray calendar, C. C. VINCENT and M. A. WILLIS (*Idaho Sta. Circ.* 6 (1918), pp. 8).—This calendar gives in concise form the latest information relative to the control of insect pests and plant diseases found in orchards and gardens in Idaho.

Spray and practice outline for fruit growers, C. P. HALLIGAN and R. H. PETTIT (*Michigan Sta. Spec. Bul.* 86 (1918), pp. 3-24, figs. 6).—This bulletin outlines the general treatment for spraying orchard fruit, grapes, small fruits, potatoes, tomatoes, muskmelons, and cucumbers, and gives directions for preparing spray mixtures.

Insecticides and fungicides, 1916 and 1917, C. D. WOODS (*Maine Sta. Off. Insp.* 86 (1918), pp. 28-32).—The requirements of the State law are stated and analyses are given of all samples received by the Commissioner of Agriculture during the years 1916-17.

Report of the South Haven Experiment Station, I. R. NOTEWARE (*Michigan Sta. Rpt.* 1917, pp. 673-678).—The results of experimental spraying on apples, peaches, plums, and grapes are briefly summarized.

A comparative test was made of nicotin sulphate, 40 per cent, combined with lime-sulphur, at the rate of 1 oz. to 8½ gal., and Scalecide, 1 gal. to 30 gal. of water, for the control of plant lice on apples. Nicotin sulphate gave the best control and did not injure the foliage. Scalecide gave fairly good results, but injured the tender foliage considerably at the time of the second application when the fruit buds were showing color. It is suggested that Scalecide may prove of value in controlling plant lice when used as a late application for scale.

Lead arsenate was much more effective than calcium arsenate for controlling the larvæ of the codling moth. No injury could be determined from either of the poisons used, and there was little difference in their handling, mixing, and weathering qualities.

Both atomic sulphur and self-boiled lime-sulphur effectively controlled brown rot on peaches. Hydrated lime and sulphur gave fairly good results and is considered worthy of further trial. No spray injury to fruit was noted. Peach scab and bacteriosis occurred on the leaves to some extent on all of the plats. The self-boiled lime-sulphur and hydrated lime-sulphur sprayed trees had only a small amount of infection.

The results from spraying experiments with plums showed a lack of uniformity. Attempts to control pear psylla by summer spraying were unsuccessful. It is pointed out that control should be by the late fall or early spring applications, as in summer they are too active and protected too much by the foliage.

In spraying experiments with grapes foliage injury was most severe on the plat sprayed with Bordeaux 4:4:50, followed by the plats sprayed with Bordeaux 3:3:50, Bordeaux 2:2:50, Adheso, and Pyrox.

[New fruits, ornamentals, and other plants], N. E. HANSEN (*South Dakota Sta. Rpt. 1917, pp. 25-32*).—In continuation of previous reports (E. S. R., 37, p. 833), brief descriptions are given of new varieties sent out for trial in the spring of 1917, together with notes on progress in breeding and selection. The varieties distributed include the Ojibwa, Cree, and Pembina plums, respective hybrids of the Manitoba wild plum (*Prunus nigra*), and the Shiro, Combination, and Red June; the Kaw and Kiowa plums, hybrids of the Kansas sand plum (*P. watsoni*) and the Wolf; the Moscow cherry, a hardy seedling of Russian origin; a blight-resistant pear stock (*Pyrus ussuriensis*) from the Pacific coast section of Siberia; the Giant Wild crab, from scions procured in Illinois; the Dolgo crab, a new red-jellied Siberian crab apple; and a new Siberian muskmelon.

Some progress has been made in breeding blight-resistant pears. Most of the *Pyrus ovoides* or *sinensis* hybrids have proved resistant against blight the past three years. Seedlings of the Japan pear, which are also blight resistant, appear to be the best commercial stock for these hybrids. In view of the varying hardiness of the Japan seedlings, however, it is believed that *P. ussuriensis* from the Pacific coast of Siberia will be the coming pear stock, since it is both hardy and strongly resistant to blight.

Experiments in the use of Siberian crab stocks to overcome root killing in northern-grown apple trees are being continued. Relative to the problem of breeding a hardy winter apple for the prairie Northwest, the author reports that after growing fully 10,000 seedlings along various lines of pedigree only two crab apples, Amur and Ivan, and one apple, the Sereda, have been named and introduced. A number of promising seedlings are coming on along new lines of pedigree.

As a result of work with native gooseberries, great improvement was shown in 1916 in the fruiting of the sixth generation of seedlings, many of which produce fruit of good culinary quality and larger than some of the leading western commercial varieties. A number of hybrids with the larger European gooseberry producing fruit of excellent quality and considerably larger than the pure wild seedlings are being propagated for distribution.

Some very promising raspberry seedlings fruited for the first time during the past season. Thus far hybridizing has given much quicker results than selection from pure native seedlings.

Among the rose seedlings blooming for the first time, a hybrid of the Tetonkaha with the American Beauty is especially promising. It bloomed all summer and combines in a large measure the hardiness of the Tetonkaha with the large size and rich fragrance of American Beauty.

[Report of the] State fruit breeding farm, Zumbra Heights, C. HARALSON (*Minnesota Sta. Rpt. 1917, pp. 86-89*).—A brief progress report on variety and seedling tests of apples, plums, grapes, gooseberries, currants, raspberries, and strawberries, including a report of the committee (G. A. Anderson and F. J. Kimball) examining the Minnesota State fruit-breeding farm. This report briefly notes some of the more promising fruits observed.

[Report of the] horticultural department, A. W. DRINKARD, JR. (*Virginia Sta. Rpt. 1917, pp. 11-20, figs. 5*).—A cylinder and orchard experiment is being conducted to secure further knowledge relative to the influence of nitrogen, potash, and phosphoric acid, used both alone and in combination, on the formation of fruit buds. The results secured with apples grown in cylinders for

the fruiting seasons 1913 to 1917, inclusive, together with the results secured in one peach orchard for the fruiting seasons 1915 to 1917, inclusive, are here presented in tabular form and discussed. The apple trees under test in the orchards have not fruited yet. Briefly summarizing the results to date, the fertilizer applications to apple trees grown in cylinders have not thus far produced as marked differences in the formation of fruit buds as variations in the moisture content of the soil. Although marked differences are appearing in the growth of peach trees under varying cultural treatments to maintain different quantities of soil moisture, the fertilizer treatments within the series do not yet show consistent results.

In the work of breeding late-blooming apples a number of hybrid seedlings have been secured but none of these has yet fruited. A test of the commercial value of dwarf apple trees has been under way since 1907. The results thus far secured tend to discourage the planting of dwarf trees in a commercial orchard. Of many varieties propagated on Doucin or half dwarf stocks only a small number came into bearing much earlier than when grown on the standard stocks. The Yellow Transparent is the only strikingly early and consistent bearer in the lot, having borne full crops in alternate years since the third year from planting. In size and quality the fruit is superior to that of the same variety on standard stocks growing under practically the same soil and cultural conditions. Several other varieties have fruited in a very satisfactory way on dwarf stocks and it is concluded that the dwarf tree has a distinct place in the home fruit garden where only a small area of land is available for tree planting.

In an experiment looking to the control of fire blight Bartlett and Sheldon pear trees have been grown both in sod and under cultivation since 1913. Both parts of the orchard received different fertilizer treatments. The results of the experiment as briefly summarized show that the pear trees blighted badly and in about the same degree in all plats, irrespective of cultural and fertilizer treatments. There was no appreciable protection against fire blight from applications of acid phosphate and sulphate of potash.

[Experiments with the apple, plum, and blueberry], W. G. BRIERLEY (*Minnesota Sta. Rpt. 1917, p. 57*).—As a result of pruning investigations conducted with apples and plums no material difference has been noted in the behavior of trees pruned during the months from November to April. May pruning has given a slightly less vigorous shoot growth and young trees pruned in June after growth was well under way have been seriously checked in the development of shoots. Hence it appears that it is undesirable to delay the usual pruning operations as late as June for trees up to 10 or 12 years old. Older and well-established trees which were pruned in June to remove a minor amount of surplus shoot growth were apparently in no way different from similar trees pruned during winter or spring. The experiment indicates that apple trees in Minnesota may be pruned safely at convenient times from November to May or during the dormant season with practically no injury from winter conditions.

As a result of experiments in propagating blueberries which were started in 1916 at the Forest Experiment Station, Cloquet, it was found that it is very advantageous to use some portion of the root in the propagation of the low-bush type of blueberry (*Vaccinium pennsylvanicum*). Seedlings of the high-bush type (*V. corymbosum*) passed the winter with little apparent injury, indicating that the cultivation of this type is possible in Minnesota.

Fertilizer experiments on apple trees at Highmoor Farm, C. D. Woods (*Maine Sta. Bul. 269 (1918), pp. 9-15*).—In continuation of a previous report (*E. S. R., 37, p. 647*), data are given showing the yields of apples in pounds per

tree for the seasons 1914 to 1917, inclusive, secured with differing fertilizer treatments. The plan of the experiment, which was started in 1912, includes a test of fertilizers both on cultivated trees and on trees grown in sod. All of the plats received cultivation with a cover crop of rye until August, 1916, when the sod plat was seeded to grass. The fertilizer test comprises a comparison of a 5:8:7 formula applied at the rates of 7.2 lbs. and 14.2 lbs. per tree.

The effects of fertilizer treatments were noticeable in 1915 and 1916 when there was a small but constant difference in favor of the fertilized plats. The yield increased with the amount of fertilizer applied. In 1917, for some unknown reason, the yields for the fertilized plats dropped 40 per cent below the yields for the plat without fertilizer for four years. There was no marked difference in this respect between the trees receiving the light and those receiving the heavy applications of fertilizer.

Some data are given showing the size of the apples and their color for 1917 when part of the plats were in sod. Comparative data on size and color are also given for the two previous years. The results for one year in grass show a reduction in size and improvement in color as compared with the cultivated plats. Generally speaking, the larger the size of the fruit the poorer the color, and the smaller the fruit the better the color. The experiment is to be continued until decisive results are obtained and the unfertilized plat shows evidence of the need of plant food.

Field experiments in spraying apple orchards in 1913 and 1914, B. S. PICKETT, O. S. WATKINS, W. A. RUTH, and A. J. GUNDERSON (*Illinois Sta. Bul.* 206 (1918), pp. 427-509, figs. 6; abs., pp. 4).—The field experiments here described in detail include further tests of the effectiveness and relative values of the standard sprays on the control of fungi and insects affecting the apple crop, of several makes and brands of arsenate of lead, certain new and proprietary fungicides, several methods of preparing and using copper ferrocyanid, the effects of varying quantities, pressures, and nozzle openings, the use of Bordeaux for some applications and lime-sulphur for the remaining applications in the spray schedule of the same season, the effects of certain spray practices on the control of codling moth, and the efficiencies of various strengths of lime-sulphur. The recommendations based on these experiments and also upon earlier work are embodied in Circular 212 of the station, previously noted (E. S. R., 39, p. 39).

The data obtained in 1913 and 1914 add further evidence of the effectiveness of spraying. Wherever fungus diseases appeared high degrees of control were secured and codling moth and curculio injuries were effectively reduced. In no case did the application of arsenate of lead fail to exercise a decidedly beneficial effect in reducing the injury from curculio. Banding trees for trapping the larvæ of codling moth proved a useful supplement to spray practices. It is concluded that both Bordeaux and lime-sulphur are efficient fungicides, but that neither is always free from injurious effects upon the fruit and foliage; that lime-sulphur used for sprays before July 1 is less likely to injure the fruit and foliage than Bordeaux; that lime-sulphur used after July 1, or during excessively hot weather, is more likely to injure the fruit than Bordeaux; that lime-sulphur used throughout the season (if only one spray can be used) is safer than Bordeaux; and finally, that the most desirable practice is to use lime-sulphur for all the applications made in April, May, and during cool weather in June, and Bordeaux for applications made in July, or to omit the fungicide entirely from the July sprays, unless the season is very favorable for the development of bitter rot or other fungus diseases.

No definite conclusions were drawn with reference to the relative efficiency of different brands of arsenate of lead. Evidence was obtained to show that

copper ferrocyanid, calcium hyposulphite, and several proprietary fungicides were less desirable as all-round fungicide sprays than the standard spray mixtures. Although copper ferrocyanid was prepared in a number of different ways, the results secured did not warrant its recommendation as a spray.

Large quantities of sprays generally gave more protection than small quantities, but caused more spray injury to the fruit. High pressures appeared not to be responsible for fruit injury, except in so far as they were accompanied by the application of large quantities. The character of the nozzle openings chiefly affected the quantity and did not show results differing from those which accompanied corresponding quantity applications. A large amount of spray driven home under considerable pressure is desirable for the calyx spray, and owing to the variation in the severity of codling-moth attacks and in the times of their appearance, the most effective spraying can be done only when the orchard is under careful observation to determine the probable time of appearance of the broods and the probable severity of the attacks. Such results as were obtained show that almost equal amounts of burn occurred where weak and where strong solutions of lime-sulphur were used, together with equal control of sooty blotch, the only disease recorded.

Dusting and spraying experiments with apples, W. C. DUTTON (*Michigan Sta. Spec. Bul.* 87 (1918), pp. 24, figs. 6).—A report of progress made in comparative tests of lime-sulphur lead arsenate used as a spray and as a dust that have been conducted for the past three years in cooperation with a number of orchardists. No definite conclusions are drawn at this time, as the use of dusting material as a substitute for liquid mixtures is considered to be still in the experimental stage. As compared with spraying, dusting gave unfavorable results in the control of scab in 1915 and in 1916. On the other hand, the dusting method gave very satisfactory results in 1917. Some suggestions are given for the benefit of fruit growers who may care to try the dusting method.

A peach-dusting experiment conducted in 1917 is also reported, but no definite conclusions are drawn from the work, as there was very little injury by insects or diseases in the untreated plats. The experiment indicated, however, that peaches can be dusted safely and that peach scab and brown rot can be controlled by dusting.

In a test conducted in a Northern Spy orchard of summer sprays for apples, dry lime sulphur, used at the rate of 2.5 lbs. to 50 gal. of water, did not control apple scab on the fruit so well as the standard lime-sulphur solution, 1.25 gal. to 50 gal. of water. Dry lime sulphur did not cause any foliage injury, while standard lime sulphur did. Bordeaux did not prove to be more satisfactory than lime sulphur as a spray when the buds were showing pink.

Inheritance of sex in strawberries, R. D. ANTHONY (*New York State Sta. Tech. Bul.* 63 (1917), pp. 3-10).—In view of the fact that several investigators are using the strawberry in a study of sex inheritance, certain data referring to this problem that have been secured during nearly 30 years of strawberry breeding at the station are presented and discussed in order to call attention to some of the problems involved. Tables are given showing the sex of plants from crossing imperfect by perfect varieties of strawberries, the sex of plants from crossing perfect by perfect varieties of strawberries, the sex of plants from self-pollination of perfect strawberry varieties, and a number of abnormal cases in which crosses failed to follow the general rule.

The principal observations and deductions made from the station breeding work are summarized as follows: "A sharp line can be drawn between perfect and imperfect plants only after careful observation, which, in doubtful cases, should extend through two seasons. The production of perfect blossoms is sometimes delayed till the plant is in nearly full bloom. Conditions leading

to lack of vigor in the plant seem occasionally to suppress stamen development in perfect sorts throughout the entire season.

"In general, there are two types of imperfect blossoms—those with stamens absent or rudimentary and those with filaments at least partially developed but anthers abortive if present. Perfect varieties vary widely in the number of stamens and the amount of pollen they produce. Pure male plants have been noted by others, but none has been recorded among the thousands of plants grown at this station. Some station seedlings have probably been classed incorrectly as imperfect, but it is doubtful if such cases are numerous enough materially to influence the results. When imperfect varieties have been pollinated by perfect sorts the resulting seedlings are of the two types in practically a 1:1 ratio. The results secured when two perfect sorts have been crossed are, 2,190 perfect, 9 semiperfect, and 5 imperfect. The 5 imperfects may be regarded either as representing errors in observation or as being the product of abnormal perfects.

"The seedlings secured by self-pollinating perfect varieties differed materially from those from cross-pollinated perfects. There were 3,159 perfect, 685 semiperfect, and 474 imperfect. All of the imperfects were secured from 8 perfect varieties. The results with 4 of these are considered in a discussion of abnormal cases. Of the 7 cases in which abnormal results would seem to have been secured, 5 involved Marshall blood in varying degrees. Quality, when selfed, produced a larger proportion of imperfect seedlings than any other variety. One of these was tested in the greenhouse and produced no pollen even under such favorable conditions. When this seedling was pollinated by a perfect seedling of the same parent 31 perfect and 43 imperfect seedlings were obtained. When the seedling used as a male was self-pollinated all the progeny were perfect. The results suggest that the best method of attacking the problem would be to grow pure seedlings of a considerable number of F_1 and F_2 seedlings of both Marshall and Quality."

Strawberries, A. J. OLNEY and C. W. MATHEWS (*Kentucky Sta. Bul.* 216 (1918), pp. 67-94, figs. 10).—This bulletin contains a concise report on a large number of varieties of strawberries tested at the station from 1913 to 1917, inclusive, including also a discussion of the present status of strawberry growing in Kentucky and general cultural directions.

[Strawberries at Aroostook Farm in 1917], C. D. WOODS (*Maine Sta. Bul.* 269 (1918), pp. 43, 44).—Data are given showing the yields per acre, date of first picking, and duration of picking season for a number of varieties of strawberries grown at Aroostook Farm in 1917.

Strawberry culture, C. P. HALLIGAN (*Michigan Sta. Spec. Bul.* 84 (1918), pp. 3-19, figs. 18).—A practical treatise on strawberry culture, discussing soil management, planting and subsequent care, harvesting, renewing the plantation, varieties, and the control of insects and diseases.

Topping and pinching vines, F. T. BIOLETTI and F. C. H. FLOSSFEDER (*California Sta. Bul.* 296 (1918), pp. 371-384, figs. 3).—This bulletin reports experiments that have been conducted for two years at the university farm to test the practical effects of summer topping and pinching, with special reference to the influence on the quantity of the crop, the influence on its quality as evidenced by the sugar content of the grapes, and the influence on the vigor of the vine, as evidenced by the annual growth of wood. Two hundred and twenty 3-year-old vines of the Carigname variety and 240 6-year-old Tokay vines, all in full bearing and growing in a uniform deep rich soil, were included in the experiment. In pinching, only the extreme tip of the growing shoot was removed. In topping, from one-fifth to one-fourth of the length of the shoot was cut off. Both pinching and topping were performed once during

the season in some rows and three times during the season in others. Check rows were left in each case.

Among the important conclusions derived from the results, which are here presented in tabular form and fully discussed, the authors found that both pinching and topping are harmful under conditions similar to those under which the experiments were conducted. Heavy topping continued year after year may almost ruin a vineyard. Pinching is less harmful than topping but contrary to the usual belief is both weakening and detrimental to the crop. There was a net loss in value of crop and vigor of vines for the two years in all cases. The authors point out that moderate pinching or even topping may be employed advantageously in the cases of varieties growing in excessively rich soil, in cases of varieties producing few fruit buds on the main canes, and under some conditions where heavy winds are liable to break off whole shoots. It is concluded that probably four-fifths of the topping practiced in California is inadvisable. It should never be applied to Muscats or similar vines of weak growth nor to any varieties when not excessively vigorous. It is less harmful to young vines than to old, and is most useful for 2 or 3 year old vines to get them into the proper shape before they bear.

FORESTRY.

Trees.—What, where, when, and how to plant, C. H. SHATTUCK and I. W. COOK (*Idaho Sta. Bul. 105 (1918), pp. 66, figs. 45*).—The purpose of this bulletin is to present the results, not only of the department of forestry in growing trees during the past eight years, but of various citizens of Idaho who have been successful with tree species of value to the localities where grown or to other parts of the State, both for commercial and ornamental purposes. In addition to lists of trees recommended for ornamental uses, windbreaks, woodlots, and reforestation purposes, records are given showing the growth made by species distributed in the State, and suggestions for decorative planting and planting plans for various purposes have been prepared with special reference to the needs of the State. Notes are also given relative to methods of planting and transplanting trees.

The native woods of Sao Paulo, E. NAVARRO DE ANDRADE and O. VECCHI (*Les Bois Indigènes de Sao Paulo. Sao Paulo: [Authors], 9116, pp. V+376, figs. 227*).—A contribution to the study of the forest flora of the State of Sao Paulo, Brazil, including only those forest species which it has been possible to identify completely up to the present time. Each species is considered with reference to its nomenclature, distribution, distinguishing characteristics, flowering and fruiting season, and nature and uses of the wood. The descriptions in most cases are accompanied by illustrations of the fruit.

The eucalypts: Their culture and exploitation, E. NAVARRO DE ANDRADE and O. VECCHI (*Os Eucalyptos Sua Cultura e Exploração. Sao Paulo: [Authors], 1918, pp. VI+228, figs. 44*).—This work supercedes the manual for eucalyptus planters written by the senior author in 1911 (E. S. R., 25, p. 844). It is presented by the authors as the fruit of 14 years of consecutive studies and work in the forest service of the Paulista Railroad Company in the State of Sao Paulo, Brazil, as well as of observations made in the United States, Algeria, and Australia.

The present work is divided into three parts. Part 1 deals with the history, distribution, climatic and soil requirements of eucalypts, culture, plantation management, exploitation, insect pests and diseases, reforestation, growth, and economic importance. Part 2 takes up eucalyptus timber and other products.

Part 3 describes the forestry work of the Paulista Railroad Company in Sao Paulo, and gives species of eucalypts best adapted to that State.

Form variations in larch, L. MATSSON (*Skogsvårdsför. Tidskr.*, 15 (1917), No. 12, pp. 923-1004, figs. 8).—This embraces the results of a comparative study of European and Siberian larches which was conducted with special reference to the application to larch of volume tables for fir and pine. Studies of form and form variations as influenced by the origin of the tree, locality in which grown, etc., are also reported. The data secured were based on measurements of many sample plats. They are presented in tabular form and fully discussed.

Second report of the commission for the investigation of exotic conifers in Netherlands to the directors of the Netherlands Heath Society, F. B. LÖHNIS, J. P. VAN LONKHUYZEN, ET AL. (*Tijdschr. Nederland. Heidemaat.*, 29 (1917), No. 12, pp. 411-447).—The present report deals with the growth of exotic conifers in the sand region of Netherlands. Subsequent reports will deal with other sections of the country.

Report of the forestry department for 1916 (*Skogsvårdsför. Tidskr.*, 15 (1917), No. 10-11, *Bilaga 5*, pp. 368).—A report for the various counties of Sweden on the organization of the forestry department, means of diffusing knowledge in forest husbandry, assistance rendered in cultural and planting operations, timber prices, and a financial statement for the year.

Report of the chief forest firewarden for the year 1917, G. H. WIRT (*Penn. Dept. Forestry Bul.* 17 (1918), pp. 112, pls. 3).—In addition to detailed statements relative to the acreage, damage, cause, and cost of extinction of forest fires throughout the State, information is given relative to legal actions taken and to the work of cooperating forest-fire protective associations.

Handbook of forest protection, 1918 (*Sacramento: Cal. State Bd. Forestry*, 1918, pp. 106, pls. 3, fig. 1).—This handbook is prepared for the guidance of firewardens, to offer suggestions to the traveling public as regards care with fire, and for the use of teachers in the public schools.

On graphic tables for exploitation, E. W. RONGE (*Skogsvårdsför. Tidskr.*, 15 (1917), No. 9, pp. 811-832, figs. 10).—The author advocates the use of yield graphs as an easy means of pricing and valuing timberland. Graphs for fir and for pine constructed from height and diameter measurements are here presented and discussed.

DISEASES OF PLANTS.

An outline of the history of phytopathology, H. H. WHETZEL (*Philadelphia and London: W. B. Saunders Co.*, 1918, pp. 130, figs. 22).—The author presents an outline of some of the outstanding features in the evolution of the science of plant pathology, and he indicates what appears to him to be the part played by some of the leading men who have been concerned in its progress. A comprehensive historical and biographical bibliography of the literature of the subject is given.

Fungus diseases of plants for 1916, L. H. PAMMEL (*Iowa Yearbook Agr.*, 17 (1916), pp. 574-582, figs. 7).—Like the previous report (E. S. R., 36, p. 208), this account deals with weather conditions as related to plant diseases, a number of which are briefly discussed.

Notes on Michigan plant diseases in 1916, G. H. COONS (*Michigan Sta. Rpt.* 1917, pp. 310-317).—Wet weather during May and June was followed by a severe drought during the next two months. The prevalence of such diseases as grape black rot and apple scab emphasizes the great importance of the weather conditions at the time of the primary infection as related to questions connected with policies affecting control of such diseases.

Notes are also given on catalpa leaf spot, root rot of strawberries, peach diseases, raspberry curl or yellow, potato, tomato, cucurbit, lettuce, celery, legume, and sugar-beet diseases, oat smut, and rye smut.

[Pathological notes], D. Bois (*Bul. Soc. Path. Veg. France*, 4 (1917), No. 1, pp. 48, 49).—Brief notes are given of a tumorous growth, apparently of bacterial origin, on branches of *Acer pennsylvanicum*; excrescences 40 and even 50 cm. in diameter on *Prunus domestica* strongly attacked by *Exoascus in-sitiae*; and various effects of cold weather in the region of Elencon.

[Seed treatment for smuts], G. H. Coons (*Michigan Sta. Rpt.* 1917, pp. 300, 301).—This gives a brief description of tests of the concentrated formaldehyde treatment of grains for smut which has been developed by R. J. Haskell. In this treatment the grain is spread in a long pile and sprayed with concentrated formaldehyde at the rate of 1 pint to 50 bu. of grain as the grain is shoveled over. The grain is then covered for four hours.

Viable spores of oat smut were dusted on 2 qt. of ordinary oats, which were then sprayed with concentrated formaldehyde at the rate of $\frac{1}{3}$ cc. per quart of grain, the grain being stirred during the treatment. The duration of the treatment varied from 15 minutes to 6 days. The oats were placed in tight jars and in sacks. At the end of the experiment the spores were washed from the grain, separated with a centrifuge, and their viability tested in Van Tieghem rings. The results are reported in tabular form, and are held to indicate that the concentrated method is probably as efficient as the dilute or sprinkling method, a sufficient number of spores having been killed after one hour to make the treatment safe. The viability of the oats was only slightly affected, even after six days in a tight jar.

Observations of oats, barley, and wheat in the field treated by this method showed no reduction in stand. No smut was found in the oats, but it occurred in the wheat to the extent of 0.33 per cent, as compared with 0.1 per cent in fields treated in the ordinary way and with 2 per cent in untreated fields.

Millet smuts and their control, H. E. VASEY (*Colorado Sta. Bul.* 242 (1918), pp. 3-22, figs. 13).—This bulletin is based on two years of study of the smuts of common varieties of millet, and is issued in view of the practical character of the findings as regards seed treatment.

Smut is the principal disease of millet in the North Central and Great Plains States, particularly in Colorado, where it has begun to receive serious consideration, occurring most abundantly in El Paso, Phillips, Weld, Washington, and Yuma Counties.

These studies were confined chiefly to the varieties of millet representing *Setaria italica* (attacked by *Ustilago crameri*) and *Panicum miliaceum* (attacked by *U. panici-miliacei*). Field experiments showed that plants may be infected through the seed. The spore masses are inclosed either by the glumes or by a thin membrane, which prevent dissemination of the spores before harvest time. Generally only the lower parts of the glumes are destroyed in fox-tail millets, while the ovary is entirely destroyed. In *Panicum* millets affected heads are shortened and resemble a dark, thickened boil.

The viability of smut spores last for three years and probably longer. The plant is subject to infection during a brief stage of its early growth. Spore dissemination in the field is aided by a beetle, *Phalacrus politus*, other means of dissemination being wind, rain, and the processes of harvesting and thrashing.

The injurious effects of formalin upon the germination of spores was fully demonstrated, spores in water cultures subjected to formalin solutions for 4, 6, and 12 hours failing to germinate in all cases. It is stated that seed may be thoroughly cleaned by the use of a formalin solution consisting of 1 pint to 40 or 45 gal. water.

Oat smut, G. H. COONS (*Michigan Sta. Rpt. 1917, pp. 308, 309*).—Directions for treating oat seed for smut infection include the application of 1 pint of formaldehyde to 50 bu. grain, either concentrated for spraying or in the form of a solution for sprinkling the grain.

Notes on the control of rye smut (*Urocystis occulta*), E. A. BESSEY and W. K. MAKEMSON (*Michigan Sta. Rpt. 1917, pp. 305-307, fig. 1*).—Reporting tests with rye smut (*U. occulta*) occurring in the culm, more often in the upper portion, and causing at various Michigan points from 1 to 5 per cent injury, the authors state that the formaldehyde seed treatment which is employed against oat smut is also effective against the rye smut.

Puccinia glumarum, Miss M. A. WILLIS (*Idaho Sta. Bul. 104 (1918), p. 19*).—It was found that under favorable climatic conditions the striped rust of wheat (*P. glumarum*) can live over winter on *Hordeum jubatum*.

Diseases of truck crops and their control, J. J. TAUBENHAUS (*New York: E. P. Dutton & Co., 1918, pp. XXXI+396, pls. 70*).—This work is intended to make available the present knowledge regarding the diseases of truck crops so as to reduce preventable losses and also to stimulate further investigation on truck crop diseases. Nontechnical descriptions are given of the symptoms of diseases, and suggestions for their control are added wherever specific methods are known. The relation of the plant to its environment is discussed, after which some of the causes of losses in crops are enumerated. The specific diseases of the crops are described, the grouping being by families of host plants, as many nearly related plants are subject to attacks of the same parasitic organism. Brief chapters are given on methods of disease control; control of insect pests by natural factors; and treatment of fence posts, the latter being of importance in protecting truck crops from depredations of various kinds.

Plant pathology, J. H. MUNCIE (*Michigan Sta. Rpt. 1917, pp. 303, 304*).—Although preliminary experiments on the treatment of bean seed with calcium hypochlorite solution for bean anthracnose and blight gave promise of good results, this was not substantiated by subsequent tests, but beans in Michigan produced from Michigan seed grown in Idaho showed some resistance to blight. A Michigan variety, after being grown in the hot, dry climate at Jerome, Idaho, showed almost no blight and no anthracnose in Michigan. The tests have been continued.

Bacterium phaseoli, the cause of bean blight, has been shown to be also the cause of a girdling of bean stems at the nodes. This trouble seems to be increasing in Michigan. The bacteria are carried by wind from individual diseased plants.

A bacterial disease of peas was noted in Nawaygo County. Septoria and Ascochyta diseases of pea leaves, stems, and pods, though prevalent, were not serious. A Rhizoctonia root rot did much damage owing to unfavorable weather and soil moisture.

Yellow leaf blotch of alfalfa caused by the fungus *Pyrenopeziza medicaginis*, F. R. JONES (*Jour. Agr. Research [U. S.], 13 (1918), No. 6, pp. 307-330, pls. 3, figs. 6*).—An account is given of a study of leaf blotch of alfalfa, the investigation having been carried on at the Wisconsin Experiment Station.

This disease, which is said to be of considerable economic importance, made its appearance in 1915 and has been reported in most of the alfalfa-growing regions from New Jersey to Oregon and as far south as Tennessee. The injury is caused by a slow killing of the infected leaves, or, indirectly, by furnishing easy access for other organisms to the weakened leaves. The cause of the disease is said to be *P. medicaginis*, a fungus long known in Europe. The fungus overwinters on dead leaves infected the previous autumn. Cutting infested

fields before the ascigerous stage has developed on infected leaves appears to hold the disease in check. Control measures, when necessary, should include the removal of the dead leaves on which the apothecia develop.

Intumescences, with a note on mechanical injury as a cause of their development, F. A. WOLF (*Jour. Agr. Research* [U. S.], 13 (1918, No. 4, pp. 253-259, pls. 2, fig. 1).—After reviewing the various causes which have been assigned for the formation of different types of overgrowths known as intumescences, cankers, knots, tumors, etc., the author describes outgrowths on cabbage observed at the North Carolina Experiment Station following a severe storm in which sand was beaten upon the cabbage plants, with resultant outgrowths or intumescences. Wind blown sand as an ultimate cause of the formation of intumescences does not appear to have been previously reported. The proximate cause of these intumescences is believed to be a problem of absorption and to be due to a heightened hydration capacity of the cell colloids resulting from acids produced by oxidation.

Stemphylium leaf spot of cucumbers, G. A. OSNER (*Jour. Agr. Research* [U. S.], 13 (1918), No. 5, pp. 295-306, pls. 4, figs. 3).—Results are given of an investigation carried on at the Indiana Experiment Station of a disease of cucumbers which the author determined was due to *S. cucurbitacearum* n. sp. This disease is characterized by a distinctly mottled effect produced on the leaves, in some cases the entire leaf being involved. The causal organism has been isolated, inoculation experiments performed, and the cultural characters of the fungus are described.

Cultural work with the fungus showed that high temperatures and a dry atmosphere are unfavorable to its development. Consequently, serious trouble may be expected only in cool weather when combined with abundant moisture. The fungus lives over the winter on the diseased vines, and all such vines should be destroyed, if possible, in the fall, and crop rotation should be practiced. Preliminary experiments indicate that the disease may be controlled by the proper use of Bordeaux mixture.

A technical description of the fungus is given.

Anthrachnose of lettuce caused by *Marssonina panattoniana*, E. W. BRANDES (*Jour. Agr. Research* [U. S.], 13 (1918), No. 5, pp. 261-280, pls. 2, figs. 4).—The results are given of a study of anthracnose of greenhouse lettuce, the investigation having been carried on by the author at the Michigan Agricultural College.

While the disease does its chief damage to greenhouse lettuce, it is also known to attack field lettuce, and it has been reported in a number of States in this country, as well as in Germany, Holland, and Italy. The symptoms and etiology of the disease are described, and the results of infection experiments are given.

The cause of the disease is said to be *Marssonina panattoniana*, a fungus commonly referred to in American literature as *Marssonina perforans*. The morphological and physiological relations of the organism are described at length, and recommendations are given for the control of the disease.

Excessive watering and splashing of water from plant to plant should be avoided, and due regard should be given to ventilation. High temperature is also said to check the anthracnose, but, as the lettuce plant does not make its best growth under high temperatures, the benefit derived from this method of control would be very slight. Spraying with Bordeaux mixture or ammoniacal copper carbonate will also control the disease, but it is suggested that this method should be used only as a last resort and should not be necessary if the other preventive measures are followed.

Michigan potato diseases, G. H. COONS (*Michigan Sta. Spec. Bul.* 85 (1918), pp. 49, figs. 41).—This bulletin gives a brief account of potato diseases, the

arrangement being according to methods of control employed. The diseases are illustrated and described so that each may be readily recognized. Among the suggestions for control, the author recommends sanitary and hygienic measures, protection by sprays, and the use of resistant varieties or strains. A program for the use of planters in the control of potato diseases and suggestions for the preparation of fungicides are given.

Tomato diseases, C. D. SHERBAKOFF (*Florida Sta. Bul.* 146 (1918), pp. 117-182, figs. 13).—Popular descriptions are given of the more common and destructive diseases of tomatoes known to occur in Florida, with suggestions for their control. The recommendations include the use of seed free from disease, sterilization of seed beds, spraying for the control of fungi and various insects, irrigation where plants are liable to be subject to drought, staking of plants, use of nitrate of soda as a nitrogen fertilizer, crop rotation, etc.

Studies on resistance of tomatoes to bacterial wilt, E. E. STANFORD (*North Carolina Sta. Rpt.* 1917, pp. 92, 93).—A brief account is given of investigations in progress at the station for several years to determine whether certain commercial varieties of tomatoes possess any marked resistance or natural immunity to bacterial wilt.

As a rule only negative results were secured. It was noted, however, that a smaller proportion of one variety succumbed to wilt than of others. Seed were saved from the choicest fruits of the healthy plants, and these, together with seed from a number of other varieties, were tested the following season. Again in 1916 seed saved from plants which had remained healthy the previous year were tested, but the results obtained did not indicate that resistance of tomatoes to bacterial wilt can be augmented by seed selection from plants which remain healthy to maturity.

[Grape diseases and remedies], L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 23, pp. 534-537).—Discussing reported cases of injury to grapevines by sprays, the author states that an intimate mixture of 2 kg. of finely powdered copper sulphate with 875 to 900 gm. carbonate of soda (solvay), the whole being then gradually stirred into water, has been found to constitute an entirely safe spray liquid.

A spray liquid containing 8 per cent sulphuric acid and 12 per cent iron sulphate is said to be ordinarily sufficient to keep down anthracnose of the vines.

Downy mildew was prevalent during the year in the plains region of Hérault and in the lower valley of the Rhone, owing to conditions resulting from inundation.

[Grape diseases and remedies], L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 25, pp. 584-586).—Noting a communication bearing upon the injury to vines resulting from the employment of copper sprays (see above), the author herein suggests that the condition of the vines at the time of application may be the occasion of the injury.

Anthracnose is reported as having attacked severely branches of the variety Seibel received from Vidauban, in the department of Var.

[Grape diseases], L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 22, pp. 509-516).—Winterkilling of vines and grape downy mildew are further reported on and discussed. A rainfall of 100 mm. did not appear to be directly detrimental to the vines, but a subsequent rainfall was followed by the germination of the resting spores and the dissemination of zoospores. These are considered as very susceptible to unfavorable influences. The significance of overflows in connection with mildew is discussed, as are also the application of mildew treatments during rains, the employment of acid or alkaline sprays against this disease, and the value of direct bearing vines.

Oidium attack was more serious than during the previous year.

Notes on downy mildew (*Plasmopara viticola*), F. DE CASTELLA and C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria*, 15 (1917), No. 11, pp. 685-700, figs. 2).—A brief account is given of the sudden appearance in 1917 of grape downy mildew (*P. viticola*) throughout an area of country several hundred square miles in extent in the northeastern part of Victoria. The outbreak was of a mild nature, and its extent is attributed to the abnormal weather conditions prevailing during the summer of 1916-17. This disease and protection therefrom are discussed.

Forest disease surveys, J. R. WEIR and E. E. HUBERT (*U. S. Dept. Agr. Bul.* 658 (1918), pp. 23, figs. 23).—A number of the more common diseases to which forest trees are subject are briefly described, and the author suggests methods for making forest disease surveys which may be carried out in conjunction with timber surveys. These will furnish data of economic value in connection with sales of the areas surveyed, and will also prove of practical use in artificial and natural reforestation, as well as in indicating the general distribution of forest-tree diseases in the National Forests.

Notes on the altitudinal range of forest fungi, J. R. WEIR (*Mycologia*, 10 (1918), No. 1, pp. 4-14).—It is stated that most forest fungi have a great altitudinal range, but are usually more abundant at the lower elevations. Certain economic species predominate in certain forest zones or types. Some species show rather strict adaptation to an alpine environment. Sporophores of certain fungi exhibit many changes in form, structure, and mode of attachment with altitude. Variations in temperature and moisture with elevation may influence the development of the aerial parts much more than the portions of the fungus within the host. The influence of high mountain conditions on the form and structure of the hosts influence in turn the growth of their fungus parasites.

An undescribed canker of poplars and willows caused by *Cytospora chrysosperma*, W. H. LONG (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 6, pp. 331-345, pls. 2).—In a contribution from the Division of Forest Pathology, Bureau of Plant Industry, U. S. Department of Agriculture, the author gives the results of an investigation of a serious disease of various species of poplar that has been reported from several Western States.

The disease is caused by *C. chrysosperma*, which produces lesions and cankers on the bark. The fungus enters the host through wounds and dead branches. It is a serious parasite on poplars in the Southwest under the following conditions: On trees growing at the outer limits of their range and therefore in more or less unsuitable environment; on trees planted in streets, lawns, and cemeteries where they have been weakened from neglect and lack of sufficient water; on trees which have been severely pruned; and on cuttings in propagating beds where the usual method of propagation has been used. The fungus is known to occur in 9 States in this country on 14 species of trees. It is also found in Mexico and Europe. For the control of the disease the author recommends the selection of resistant species, the application of an abundance of water, protection against mechanical injuries, supervision of nurseries handling poplar stock, and the destruction of all nursery stock that shows any indication of the disease.

Apparent relation between height of tapping cut and black thread attacks (*Phytophthora faberi*), H. C. PRATT (*Trop. Agr. [Ceylon]*, 49 (1917), No. 1, p. 7).—Following a recent note (*E. S. R.*, 38, p. 759), the author states that he has examined about 19,000 trees situated in one block, many of which were severely attacked by black thread (*P. faberi*), the land being insufficiently drained. A constant reduction was noted in the percentage of trees infected

when these were tapped at distances of more than 3 in. above the ground. It is stated that while this disease sometimes establishes itself on cuts more than 18 in. above the ground (though not in any trees here examined), the attack is usually less vigorous than on cuts lower down.

Report on nursery inspection in Minnesota, 1916, F. L. WASHBURN (*Minn. State Ent. Circ. 41 (1917), p. 16, pl. 1*).—This account, which is supplementary to one previously noted (*E. S. R.*, 36, p. 652), contains information included in a report of wider scope which was also noted previously (*E. S. R.*, 38, p. 155). It gives a list of inspections for white-pine blister rust and brief notes on additional means undertaken or proposed for protection against this disease. Information regarding economic entomology is also included.

On the haustoria of *Pedicularis vulgaris*, A. C. MAYBROOK (*Ann. Bot. [London], 31 (1917), No. 123-124, pp. 499-511, figs. 5*).—This work was undertaken to ascertain whether phloetracheids (described by Benson as lignified cells lined with protoplasm but lacking nuclei, the end walls having been absorbed so that these elements supposedly act as a pathway and a sort of filter for the ascending sap) exist in the haustoria of *P. vulgaris* (in this case parasitic on roots of *Calluna* and on its own roots). An account is given of the general morphology of roots and haustoria and of the minute structure of their tracheidal elements.

P. vulgaris is said to attack its own roots as well as those of other plants, the haustoria having the same structure in both cases. The haustoria show phloetracheids, which in this case, however, are nucleated, differing in this respect from those described by Benson (*E. S. R.*, 24, p. 633). Phloem was absent from both roots and haustoria of *P. vulgaris*, its place being taken by elongated parenchymatous cells in the roots. The haustoria of *P. vulgaris* are less highly differentiated than is usual in case of stem parasites, the conducting cells carrying indiscriminately either organic or inorganic materials.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report of the entomologist, R. H. PETTIT (*Michigan Sta. Rpt. 1917, pp. 321, 322*).—In this brief statement of the work of the year mention is made of the occurrence of the clover-leaf beetle in some districts; *Sitones hispidulus*, which is becoming common on alfalfa in the State, even destroying entire fields in some regions, and is attacking all the clovers; a borer in young corn plants, resembling the stalk borer, which has been very destructive; the stalk borer (*Papaipema nitela*) which ravaged potato fields; etc.

Report of division of entomology, F. SHERMAN (*North Carolina Sta. Rpt. 1917, pp. 64-66*).—A brief statement of investigations during the year, including notes relative to peach spraying and an insect survey of North Carolina.

On the existence of immunity principles in insects, R. W. GLASER (*Psyche, 25 (1918), No. 3, pp. 39-46*).—"Entomological textbooks emphasize the importance of phagocytosis in ridding the insect body of foreign matter, but in reality insect blood cells are visibly rather passive. Grasshopper and caterpillar blood cells do not seem to phagocytise bacteria in an ameboid fashion. When bacteria are found within the blood cells, they may have gained entrance through their own aggression or physical factors may have been involved. The blood of normal insects, however, is somewhat antagonistic toward bacteria. This antagonism acts extracellularly. Actively immunized grasshopper blood shows a high degree of antagonism toward the bacteria used in producing this immunity. An agglutinin was found in immune grasshopper blood. Some quantitative data on the bactericidal action of immune grasshopper blood were obtained."

A new killing bottle, W. MOORE (*Ent. News*, 27 (1916), No. 7, pp. 311, 312; *abs. in Minnesota Sta. Rpt. 1917*, p. 28).—In tests of killing bottles made of various derivatives of benzene paradichlorobenzene gave the best results. While potassium cyanid will kill the insects in from one-half to one-tenth of the time required for paradichlorobenzene, there are several advantages possessed by the latter, including the ease with which the killing bottle can be prepared, the nonabsorption of water, the continuation of full strength so long as any of the material remains in the bottle, the ease with which it is remade by addition of fresh paradichlorobenzene, and its slight toxicity for higher animals. It is pointed out that paradichlorobenzene is a satisfactory substitute for naphthalene in insect boxes.

The calcium arsenates, A. L. LOVETT (*Jour. Econ. Ent.*, 11 (1918), No. 1, pp. 57-62).—These data, relating to investigations at the Oregon Experiment Station, are substantially noted on page 310.

Notes on the North and Central American species of *Acanthocephala*, E. H. GIBSON and ABBY HOLDRIDGE (*Canad. Ent.*, 50 (1918), No. 7, pp. 237-241).

Experiments with grasshopper baits, with incidental observations on the habits and destructiveness of the differential grasshopper (*Melanoplus differentialis*), A. W. MORRILL (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 175-186).—A report of observations and tests made in Arizona during the course of demonstration work against grasshoppers in 1917.

Tests of poison bait, made largely with *M. differentialis*, included a comparison of the value of cantaloups, tomatoes, etc., with lemons as constituents, of the value of molasses in the bait, of the value of sawdust as compared with bran, etc. Notes are also presented on the distance traveled by poisoned grasshoppers, relation of time of day to feeding of adult grasshoppers, and amount of alfalfa consumed by grasshoppers.

The results indicate that cantaloup can be used to displace lemon in the bait, being of equal value in attractiveness. The difference in favor of baits containing molasses was negligible, being less than 0.5 per cent. Where pine sawdust was used in the place of bran, it was only 52 per cent as efficient, whereas a mixture of pine sawdust and bran, half and half, gave results practically the same as a straight bran combination. The substitution of cantaloup for the lemons and sawdust for half of the bran in the standard formula is said to reduce the cost of the bait 20 per cent. The author's observations indicate that bait for *M. differentialis* may be spread with good results during the warm part of the day up to 3 or 3.30 p. m.

It is estimated that an average of one grasshopper per square yard may destroy an equivalent of 3 lbs. of alfalfa hay per acre per day. It was found to be very profitable to destroy the grasshoppers even when they average as few as five per square yard.

Destroy grasshoppers with poisoned bran bait (*U. S. Dept. Agr., Bur. Ent. [Pamphlet]*, [1918], pp. 4, figs. 4).—It is pointed out that the most efficient remedies discovered for the control of grasshoppers are poison bran bait and the Criddle mixture and directions are given for their preparation and use, together with an account of destruction of grasshoppers by mechanical means.

On the occurrence of a *Mermis* epidemic amongst grasshoppers, R. W. GLASER and A. M. WILCOX (*Psyche*, 25 (1918), No. 1, pp. 12-15).—The authors record the parasitism of grasshoppers by a nematode of the genus *Mermis*, probably *M. ferruginea*, which resulted in a high mortality among *Melanoplus alleni* and *M. bivittatus* in southern Vermont in late August and early September, 1917.

Key and descriptions for the separation and determination of the first instar stem mothers of the three species of aphids most commonly attacking the cultivated apple, M. T. SMULYAN (*Psyche*, 25 (1918), No. 2, pp. 19-23, figs. 3).—This paper relates to the rosy apple aphid (*Aphis malifoliae*), apple aphid, and apple grain aphid (*A. prunifoliae*).

The black cherry aphid (*Myzus cerasi*), C. P. GILLETTE (*Canad. Ent.*, 50 (1918), No. 7, p. 241).—Though observed several times on watercress, the author's observations and records indicate that in Colorado the cherry aphid continues throughout the year on the sour red cherries. It has not been recorded as occurring on the sweet cherries and has been observed but very few times in abundance upon the semiacid cherries. It yields readily to the application of contact insecticides as the leaves do not curl enough to protect the lice.

Losses caused by the clover aphid, A. C. BURRILL (*Idaho Sta. Bul.* 104 (1918), pp. 26-28).—The losses in yield caused by the clover aphid (*Aphis bakeri*) in the clover seed areas of Snake River Valley in 1916 are estimated as 75 to 80 per cent of a normal crop. Also, "the copious accumulation of aphid honeydew or liquid excreta gums up the thrashing machines and causes the seed to solidify like cement in the sacks, in this way causing no end of trouble and expense in harvesting and marketing operations."

In control work on one-third acre plats the application of blackleaf 40 with soap as a spreader destroyed from 90 to 98 per cent of the aphids, and it was found that the nicotin spray worked as well when combined with sodium arsenite spray for grasshoppers. A field station was established at Twin Falls in May, 1917, for the purpose of studying the pest, but the season was abnormal as regards weather and the occurrence of the pest, so but little progress was made.

Preliminary experiments with sodium fluorid and other insecticides against biting and sucking lice, F. C. BISHOPP and H. P. WOOD (*Psyche*, 24 (1917), No. 6, pp. 187-189; *abs. in Rev. Appl. Ent.*, Ser. B, 6 (1918), No. 5, pp. 89, 90).—Sodium fluorid (97 to 98 per cent) used as a spray at the rate of 1 oz. and 0.5 oz. per gallon immediately destroyed all stages of biting lice on cattle. Used as a dust, mixed with flour in the proportion of 1:5, it destroyed all the lice on two animals by applications, respectively, of 3 oz. dredged and worked into the hair and 1 oz. applied with a bellows dust gun. In the case of dogs heavily infested with *Trichodectes latus*, all the lice were destroyed by the application of 1 oz. of the powder by means of a dust can or by 1 oz. sodium fluorid dissolved in 1 gal. of water used as a dip.

The early stages of *Empoasca trifasciata*, H. B. WEISS and E. L. DICKERSON (*Canad. Ent.*, 50 (1918), No. 6, pp. 201-205, fig. 1).—An account of a small leafhopper which is widely distributed in New Jersey on poplar.

The sugar cane frog hopper in Grenada, C. B. WILLIAMS (*Bul. Ent. Research*, 9 (1918), No. 1, pp. 83-87, fig. 1).—This is a brief report on observations made during a visit to Grenada in December, 1916.

On the rubber thrips (*Physothrips funtumiæ*) and its allies, R. S. BAGNALL (*Bul. Ent. Research*, 9 (1918), No. 1, pp. 65-70, figs. 3).—Brief notes are presented on *P. funtumiæ* which attacks the rubber plant in Uganda and Southern Nigeria; also on *P. kellyanus* and *P. marshalli* n. sp.

Notes on *Trioza alacris* in New Jersey, H. B. WEISS and E. L. DICKERSON (*Psyche*, 25 (1918), No. 3, pp. 59-63).—Morphological and biological notes are given on this well-known European psyllid, which was introduced into New Jersey from Belgium, where it occurs on bay tree (*Laurus nobilis*).

Sprays for the control of San José scale, W. C. EDMUNDSON (*Idaho Sta. Bul.* 108 (1918), pp. 15, figs. 7; *abs. in Bul.* 104 (1918), p. 35).—This is a report of experiments conducted near Lewiston, Idaho, in which sulphur sprays (lime-

sulphur, soluble sulphur, spray sulphur, and dry lime-sulphur) and oil sprays (scalecide, crude oil emulsion from virgin crude oil, crude oil emulsion from oil testing 26° B., and dormant soluble oil) were used.

The results obtained from the use of lime-sulphur are said to have been very satisfactory and the author recommends it for the control of San José scale. Soluble sulphur gave fairly good results in 1917, but it can not be recommended for use in place of lime-sulphur. Scalecide gave the best results of all the sprays but its cost is said to be almost prohibitive. The author does not feel justified in recommending oil sprays for continual use in the orchard. The results obtained in the use of crude oil were very unsatisfactory and its use can not be recommended in Idaho. Dormant soluble oil gave very satisfactory results and is very effective in the control of this pest.

The genus *Narnia* and a key to the genera of *Anisoscelini* (Coreidae: Heteroptera), E. H. GIBSON and ABBY HOLDRIDGE (*Psyche*, 25 (1918), No. 1, pp. 1-4).

Experiments with cutworm baits, J. J. DAVIS and C. F. TURNER (*Canad. Ent.*, 50 (1918), No. 6, pp. 187-192).—Tests made of baits with the black cutworm and army worm, with a view to obtaining a substitute for the expensive wheat bran, indicate that bran is noticeably superior to new hardwood sawdust alone and even the combination of sawdust and bran, though sawdust does have some value and can be recommended where it is impossible or very difficult to obtain bran. Where sawdust is used a second application will be necessary, and a combination with some bran to prevent the mixture from scattering into too fine particles and drying quickly is preferable. A larger percentage was killed where new hardwood sawdust was used compared with old, while pine sawdust seemed to have a decided repellent effect. In tests made of different arsenicals Paris green, crude arsenious oxid, and sodium arsenite killed with approximately the same degree of rapidity, sodium arsenite being a little more prompt in its action than either of the other two.

“Paris green, crude arsenious oxid, and sodium arsenite are the more desirable for poison baits, while calcium arsenate is next in value. The results indicate that lead arsenate should only be used when one of the four poisons mentioned above is not available and then it must be used at a strength of about 1:20. Our results with arsenious acid are wholly negative. . . . There was no great difference between baits prepared with bran, lemon extract, and molasses; bran, lemon fruit, and molasses; bran and lemon extract; bran and lemon fruit; bran and molasses; and bran and bananas. However, in all of the experiments where lemon extract was used in comparison with lemon fruit, the extract gave a higher percentage of effectiveness, and these experiments, although carried on in the laboratory, seem to be sufficiently conclusive to warrant the use of lemon extract in place of fruit if more convenient. There seems to be no noticeable difference in baits where molasses was used and where it was left out, and conversely approximately equal effectiveness was obtained where the fruit or extract was left out of the bait. We had only two experiments using banana in place of the citrus fruits, and the results were very satisfactory and warrant further trials in the field.”

Ascogaster carpocapsæ, a parasite of the oriental moth, A. M. WILCOX (*Psyche*, 25 (1918), No. 1, p. 17).—The author records the rearing in June, 1917, of a single specimen of the braconid parasite *A. carpocapsæ* from a cocoon of the oriental moth (*Cnidocampa flavescens*), collected at Dorchester, Mass. This species, which parasitizes the codling moth, was first described in 1909 under the name *Chelonus carpocapsæ*.

Notes on a spirea leaf roller (*Olethreutes hemidesma*), R. L. WEBSTER (*Jour. Econ. Ent.*, 11 (1918), No. 2, p. 269).—The author records this pest as

having been common on spirea at Ames, Iowa, in July, 1916 and 1917, and abundant and a source of considerable injury to spirea in a nursery near Cedar Rapids in August, 1916.

Notes on the Ethiopian fruit flies of the family Trypaneidae, other than *Dacus*, with descriptions of new genera and species, I. M. BEZZI (*Bul. Ent. Research*, 8 (1918), No. 3-4, pp. 215-251, pl. 1, figs. 3).—Tables for the separation of the Ethiopian genera of Trypaneidae are followed by accounts of 48 forms, of which 5 genera, 12 species, and 2 varieties are described as new to science.

Notes on Diptera, J. M. ALDRICH (*Psyche*, 25 (1918), No. 2, pp. 30-35).—The author records the establishment of the salt fly (*Ephydra gracilis*) of Great Salt Lake in San Francisco Bay, apparently having been transported thence by trains crossing the Great Salt Lake on the Southern Pacific cutoff west of Ogden. The rearing of the common leaf miner *Agromyza pusilla* from mines in the leaves of the common milkweed (*Asclepias syriaca*) and in leaves of horsemint (*Monarda punctata*) is also reported.

A new genus of Cyrtidae from South America, F. R. COLE (*Ent. News*, 29 (1918), No. 2, pp. 61-64, figs. 5).—*Villulus chilensis* n. g. and n. sp. is described from Chile.

The radish maggot, P. J. PARROTT and H. GLASGOW (*New York State Sta. Bul.* 442 (1917), pp. 693-715, pls. 8, figs. 2).—This is a report of studies of the cabbage maggot as a radish pest, accounts of which studies by Schoene have been previously noted (*E. S. R.*, 35, p. 855).

This maggot, which is a common pest of radishes, varies in importance from year to year, being very destructive during some seasons. Its injury to radishes in New York State occurs during the latter part of May and early June.

"Experiments during the past four years to determine the influence of time of planting upon the numbers of insects and extent of injury showed, in 1914, severe infestation in plantings of radishes maturing about June 9; for 1915 and 1916, considerable infestation in plants harvested about June 1 and June 15, respectively; and, in 1917, slight injuries only during June. In general, radishes pulled before the latter part of May have been free from important injuries.

"Screening of radish beds is an efficient method of affording protection from maggot injury. Under normal seasonal conditions plants raised in screened frames grow more rapidly and have generally been superior in size, succulence, and tenderness to those produced in open beds. In 1917, when temperature and precipitation during growing months were abnormal, only slight differences existed in the conditions of plants produced by the two methods. Practical measures for production of radishes that are largely exempt from insect attack are early sowing and growing of plants in frames screened with cheesecloth."

Controlling a radish pest, F. H. HALL (*New York State Sta. Bul.* 442, popular ed. (1917), pp. 8, figs. 2).—A popular edition of the above.

Molasses sprays for the control of *Monarthropalpus buxi*, E. N. CORY (*Jour. Econ. Ent.*, 11 (1918), No. 2, p. 269).—In spraying tests conducted by the author for the control of the boxwood midge on a hedge in Baltimore, Md., in May, when the adults were emerging, large numbers were entrapped on the surface of the leaves by the use of molasses at strengths of 1 lb. and 4 lbs. to 50 gal. of water, particularly by the 4:50 strength.

Note on oviposition of *Gastrophilus nasalis*, C. H. T. TOWNSEND (*Canad. Ent.*, 50 (1918), No. 7, pp. 246-248).—The author reports upon observations made while in camp on the East Verde River, Ariz., of oviposition by *G. nasalis*, in which the eggs with their sharp bases were found penetrating and adhering in the skin of the upper lip of the horse. *G. intestinalis* was common along the East Verde River, but caused no such alarm while ovipositing as did *G. nasalis*,

Observations and experiments on the bean and pea weevils in Kentucky, H. GARMAN (*Kentucky Sta. Bul.* 213 (1917), pp. 309-333, pls. 5, fig. 1).—A popular account is given of the bean weevil (*Bruchus obtectus*), two cowpea weevils (*B. 4-maculatus* and *B. chinensis*), and the pea weevil (*B. pisorum*), together with observations relating to their biology.

Experiments with carbon bisulphid for the destruction of these weevils indicate that at a temperature of about 70° F. all stages of the insects will be killed by using from 1 to 2 oz. of bisulphid of carbon in 10 cu. ft. of space, with an exposure of 24 hours. Water heated to 120 to 130° was found to kill the weevils when immersed 3 or 4 minutes, and a dry heat of 122° gave the same result. Seeds exposed to higher temperatures than these for the same or greater lengths of time were not injured, as was shown by germination tests. Tests made showed that an exposure to 0° F. overnight will destroy all the stages of the weevil, as well as most grain-infesting insects, including the Angoumois grain moth, when the change is made suddenly. A determination was made of the maximum practical temperature (moist heat) and periods at which cowpea, wheat, and corn seed can be exposed, and also the higher temperatures to which they can be exposed and some perfect plants still obtained.

Mention is made of an unidentified chalcidid which destroyed considerable numbers of cowpea weevils in Kentucky.

The parthenogenetic reproduction of *Otiorynchus sulcatus*, J. FEYTAUD (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 22, pp. 767-769).—The author's observations of *O. sulcatus*, a grape-root weevil, have shown it to reproduce parthenogenetically like *O. turca*, *O. crivicollis*, and *O. ligustici*. He considers it probable that males appear sporadically. The females deposit more than 150 eggs, and the reproduction of the species takes place very rapidly.

Oviposition of *Rhynchites conicus* and the anatomy of its larva, L. BORDAS (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 2, pp. 70-73; *abs. in Rev. Appl. Ent., Ser. A*, 5 (1917), No. 12, p. 569).—This paper relates to a small weevil which attacks the buds and young shoots of apple, pear, cherry, and peach trees. A perpendicular gallery is bored below the point of insertion of a leaf or an axillary bud and two or three eggs deposited therein, resulting in the drying up of the terminal shoot and the falling of the withered buds.

Notes on false wireworms, with especial reference to *Eleodes tricolorata*, J. W. MCCOLLOCH (*Jour. Econ. Ent.*, 11 (1918), No. 2, pp. 212-224, pl. 1).—This is a report of studies at the Kansas Experiment Station of the morphology and biology of false wireworms, particularly *E. tricolorata*. It appears to be a pest of native prairie grasses. The larvæ, which are subterranean in habits, are found during the summer and fall from 1 to 6 in. or more below the surface of the ground. From 6 to 11 days are required for incubation during July and early August. In 1915-16 the larval stage averaged 267 days and in 1916-17, 292 days. Pupation took place in the spring of 1916 during the last week in May and the entire month of June, the pupal period averaging from 17 to 19.4 days. The length of the life cycle averaged 328 days. It has not yet become of sufficient economic importance to warrant any extensive control experiments.

A list of 27 references to the literature is included.

Popillia japonica, a recently introduced Japanese pest, E. L. DICKERSON and H. B. WEISS (*Canad. Ent.*, 50 (1918), No. 7, pp. 217-221, fig. 1).—The authors record the occurrence of the injurious Japanese scarabæid beetle *P. japonica* in southern New Jersey, where it was first discovered in a nursery in August, 1916. In the nursery the beetles were found feeding on the foliage of *Ampelopsis*

quinquefolia, flowering cherry, grape, elder, *Crataegus*, button bush, and in or on the flowers of double Althea, Spirea, and *Vitex agnus-castus*. Its feeding resembles that of the rose chafer and other scarabaeids, but the destruction of the foliage is much more complete. Smartweed (*Polygonum virginianum*), tearthumb (*Tinaria arifolium*), evening primrose (*Oenothera biennis*), and Virginia creeper (*A. quinquefolia*) were the principal food plants among the weeds and in some cases the leaves of these plants were completely riddled. Other weeds infested to a less extent were ragweed (*Ambrosia* sp.), velvet leaf or Indian mallow (*Abutilon avicennae*), jewel weed (*Impatiens* sp.), and the blossoms of milkweed (*Asclepias syriaca*). This beetle, which is a pest of considerable importance in Japan, was probably introduced about six years ago in the soil about iris roots.

The North American species of *Cerchysius*, females, A. A. GIRAULT (*Ent. News*, 29 (1918), No. 2, pp. 65, 66).

The control of mites, B. F. KAUPP (*North Carolina Sta. Rpt. 1917*, p. 58).—The author has found that in order to be effective sulphur must be in solution and nicotin must be free from the stems and leaves. A formula recommended consists in boiling 2.5 lbs. of tobacco stems and leaves for one hour in sufficient water to cover them, then draining the liquid off, and boiling down to 0.25 pint; to this is added 4 oz. of water containing 1 tablespoonful of nicotin and 1 qt. of plaster of Paris.

Lipeurus dovei n. n., E. A. MCGREGOR (*Psyche*, 25 (1918), No. 3, p. 46).—The name *L. dovei* is proposed as a substitute for *L. lineatus*, which is preoccupied.

FOODS—HUMAN NUTRITION.

Studies of food utilization.—I, The utilization of carbohydrates on relatively high and low cereal diets, ZELMA ZENTMIRE and C. C. FOWLER (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 77-85).—In a study of food utilization undertaken to ascertain how much, if any, difference occurs in the utilization of cereal protein and cereal carbohydrate when ingested in varying amounts in the form of thoroughly cooked "Cream of Wheat," this article records data on carbohydrate utilization. The authors state that "in so far as conclusions may be drawn from one experiment, upon one individual, with one cereal, the data secured seem to justify the following conclusions:

"The utilization of total carbohydrates of a diet consisting largely of cereal is above 99 per cent. The carbohydrate is as completely utilized with one quantity as another of cereal in the diet, even when the cereal is taken in larger amounts than are found in the average dietary.

"Assuming that sucrose and lactose are completely digested and absorbed, the utilization of the cereal carbohydrate is still high (97.7 to 99.0 per cent). Assuming that sucrose is completely utilized, the starch of the starch diets is utilized to the extent of over 98 per cent.

"Monotony and unpalatability of diet have little or no effect upon the ultimate utilization."

A bibliography is appended.

Experiments on the nutritive value of maize protein and on the phosphorus and calcium requirements of healthy women, H. C. SHERMAN, LUCILE WHEELER, and ANNA B. YATES (*Jour. Biol. Chem.*, 34 (1918), No. 2, pp. 383-393).—The experiments described in this paper were designed to study the phosphorus and calcium requirements of healthy women and to make some study of the efficiency of utilization of maize products to human nutrition.

From the data collected from feeding experiments made on two women subjects the authors draw the conclusions that "the results must be regarded as

highly favorable to the efficiency of maize protein in normal (adult) human nutrition, because the continued use of a low protein diet, in which 47 per cent of the total protein was from wheat flour and 31 per cent from corn meal, showed the latter to be efficiently used in the maintenance of nitrogen equilibrium, and because the abrupt substitution of maize protein for wheat protein to an extent affecting one-fifth of the total protein intake was without any unfavorable effect upon the nitrogen balance."

In regards to the calcium and phosphorus requirement one subject metabolized 0.71 gm. of phosphorus per day and the other 0.69 gm. phosphorus. "The metabolism of 0.71 and 0.69 gm. of phosphorus per day as minima for these two women, weighing 60 and 54 kg. (132 and 119 lbs.), respectively, would, if computed on the assumption that the requirement is proportional to the body weight, correspond to 0.83 and 0.89 gm., respectively, as the minimum requirement of a man of average size (70 kg.) per day." It seems probable that the average of 0.45 gm. of calcium per 70 kg. of body weight per day approximately represents the minimum maintenance requirement for normal human nutrition.

Studies of experimental scurvy.—II, The influence of grains, other than oats, and specific carbohydrates on the development of scurvy, W. PRZ (Journ. Biol. Chem., 33 (1918), No. 3, pp. 471-482, figs. 12).—This paper presents data which give further substantiation of the theory advanced by McCollum and Pitz (E. S. R., 38, p. 568) that scurvy in the guinea pig is not the result of a deficiency of any specific protective substance, but that it is the result of absorption of toxic substances arising from putrefaction in the cecum due to an undue retention of feces. A bibliography is appended.

Is the neuritis-preventing vitamin concerned in carbohydrate metabolism? E. B. VEDDER (Journ. Hyg. [Cambridge], 17 (1918), No. 1, pp. 1-9).—"Fowls fed on polished rice and allowed to eat ad libitum consumed from 30 to 70 per cent of their body weight and from 1.4 to 3.6 per cent of their body weight daily before the development of polyneuritis. Under these conditions the rapidity with which polyneuritis develops bears no relation to the amount of rice eaten, but depends upon the idiosyncrasy of the fowl to this deficiency. Experiments performed to determine the relation of the antineuritic vitamin to carbohydrate metabolism by hand feeding birds with varying amounts of carbohydrate foods are fallacious if the amounts fed are too excessive or too minute. The birds receiving too much die from overfeeding and the birds receiving too little die of starvation. Fowls fed on sterilized meat or sterilized egg will develop polyneuritis. When fowls are fed on equal parts of sterilized meat and rice or sterilized egg and rice, they develop neuritis more slowly than when fed on sterilized egg or sterilized meat alone.

"These experiments all indicate that the antineuritic vitamin is not concerned in carbohydrate metabolism."

The ash of our foods, G. L. TELLER (Amer. Food Jour., 13 (1918), No. 3, pp. 124-126).—A discussion of the importance of ash constituents in the diet and the distribution of these ash constituents in various foods. In regard to the controversy over the amount of ash constituents in white flour, the author holds that "with a normally balanced supply of foodstuffs, as they are ordinarily consumed by average human beings, no deficiency exists even when the products of white flour amount to a considerable proportion of the daily diet."

A consideration of some dried vegetables, with special reference to their nitrogen and calcium content, M. H. GIVENS (Journ. Amer. Med. Assoc., 70 (1918), No. 23, pp. 1743-1746, fig. 1; abs. in Chem. Abs., 12 (1918), No. 15, pp. 1575, 1576).—Various fresh vegetables were desiccated and their nitrogen and calcium content compared with that of the corresponding fresh vegetables.

The results, which are expressed in graphical form, indicate that some of the materials are possible, valuable, and hitherto unappreciated sources of lime to supplement foods, such as cereals, which are deficient in lime.

Food oils and fats, E. M. BAILEY (*Connecticut State Sta. Bul.* 201 (1918), pp. 201-211).—This bulletin discusses briefly the source, preparation, and composition of the principal fatty foods. The fats are discussed under the three classes of salad oils, cooking fats, and butter and its substitutes. Analyses are included for various cooking fats, nut margarins, and oleomargarin.

A chemical study of food fishes.—The analysis of twenty common food fishes, with especial reference to a seasonal variation in composition, E. D. CLARK and L. H. ALMY (*Jour. Biol. Chem.*, 33 (1918), No. 3, pp. 483-498).—This study shows that the flesh of fish varies in fat, water, and nitrogen content according to the time of the year. A bibliography is appended.

Soy beans as human food, A. ITANO (*Massachusetts Sta. Bul.* 182 (1918), pp. 10).—A popular presentation of the use of soy beans as human food with methods of preparation of the beans in use in Japan and China. Soy-bean milk, soy-bean curd, soy-bean cheese, and soy-bean sauce are some of the well-known products of the Orient that are described.

A note on the analysis and composition of the seed of the silver maple (*Acer saccharinum*), R. J. ANDERSON (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 509-513).—Analyses of the cotyledons of the pericarp of the seed of the silver maple are reported. The chief constituents are starch, protein, and sucrose. The principal protein is a globulin. The ash contains much potassium and phosphorus, the latter being present in the seed, chiefly in organic combination. The possibility of utilizing the seed as a food is suggested.

Twenty-second report on food products and tenth report on drug products, 1917, J. P. STREET (*Connecticut State Sta. Bul.* 200 (1917), pp. 101-161).—A report of the analyses of 1,354 samples of foods and drugs, together with a rather detailed report of a study of bread, dealing with the influence of certain "yeast foods" or "bread improvers," as well as a study of variations in the weights of bread due to inequalities in the working of the molding machines and sealing operations at the bakeries, and also of variations due to the drying out of the loaves between the time of baking and their purchase by the consumer. The methods of fat determination in bread have also been reviewed and losses in fat heretofore attributed to losses during the baking process have been shown to be due almost entirely to failure of the official method to extract the fat.

A series of baking tests conducted in several bakeries with a proprietary yeast food, consisting of calcium sulphate 25, ammonium chlorid 9.7, potassium bromate 0.3, sodium chlorid 25, and patent wheat flour 40 per cent led to the conclusion that the use of this preparation "requires not only half the normal amount of yeast, but that by using this smaller amount of yeast less carbohydrates were destroyed, and that the presence of the . . . salts, more particularly ammonium chlorid, stimulated yeast production, with an actual increase of protein in appreciable amounts. Moreover . . . this saving of food ingredients was secured without any sacrifice in the quality or nutritive value of the bread."

A study of the method of drying vegetables by means of a current of untreated air from an electric fan is also reported. It was found that vegetables dried by this method did not have the keeping qualities of those dried with artificial heat or by the sun's heat. Analyses of 18 samples of dried vegetables are reported.

Food surveys (*U. S. Dept. Agr., Bur. Markets, Food Surveys*, 1 (1918), Nos. 2, pp. 18, figs. 19; 3, pp. 8).—The first of these two numbers present data as to the

total available supply of wheat, wheat flour, and miscellaneous wheat food products in the United States on January 1, 1918, including commercial stocks of bakery products. The plan and purpose of the food surveys of this department are also explained.

The second number reports data as to commercial stocks of grain, flour, and miscellaneous food products in the United States on May 1, 1918, including a summary of cold-storage reports.

Food and how to save it, E. I. SPRIGGS (*London: Govt., 1918, 2. ed., pp. 52, pl. 1*).—A popular discussion of foods from the economics and dietetic viewpoint, the aim being to instruct the people of England how to make the best use of the available food products. Recipes are included, and several sample diet sheets designed to help in the wise planning of meals are given.

Corn calories for conservation.—How half of each day's nourishment may come from corn.—Recipes and menus for a week, D. MONROE, ELIZABETH GUILFORD, and ANNA COLMAN (*Teachers Col. N. Y. Bul. 12, 9. ser. (1918), pp. 28*).—Menus for a week with recipes for corn dishes are given, so planned that one-half of the total calorie yield of the daily food comes from corn products.

Some problems of nutrition in the Army, J. R. MURLIN (*Science, n. ser., 47 (1918), No. 1221, pp. 495-508*).—The work of the Food Division of the Surgeon General's Office is here discussed, also army rations now in use in the U. S. Army and in those in other countries. These rations are compared with the average family diet, the data for the latter being taken from the unpublished family dietaries which the U. S. Department of Agriculture has collected as a part of the national dietary survey which is being made.

Communal kitchens in European countries, ANICE L. WHITNEY (*Mo. Rev., U. S. Bur. Labor Statis., 6 (1918), No. 6, pp. 58-63*).—The movement for the institution of communal kitchens is reported as successful in many of the warring countries. In March, 1918, 250 such kitchens were in operation in Great Britain with the prospect of the number increasing to 1,000 within two months.

"The object aimed at by the Ministry of Food in the extension of the facilities for communal feeding is not the relief of any one class of citizens but the endeavor to secure national economy in the use of fuel and foodstuffs and at the same time to insure the well-being of all. It is realized that not only is there much waste in many households but that even when this loss is reduced to a minimum the same amount of food which is prepared in many separate establishments can be much more economically cooked in one centralized kitchen. . . .

"Some of the direct advantages of the plan, aside from the all-important point of making the food supply go as far as possible, are the saving of fuel in the home and the opportunity it affords the poorer classes to obtain both cheaper and better food. In industrial sections it is also of advantage to working mothers who have little time to prepare meals for their families, for it is a means of saving them much labor and at the same time enables them to provide more nourishing meals for the children. The kitchens make an appeal also on the point of convenience, since the buying of food supplies is becoming increasingly vexatious, often entailing the necessity of standing for hours in queues with the chance that the supply may fail before all customers are served."

Such communal kitchens are being run in Germany with the same general effort to reach all classes as has been made in England. No very recent statistics are available, but "a report of last December estimates that in communes of over 10,000 inhabitants one-quarter of the population uses the kitchens; in those of over 500,000 inhabitants, one-third.

"In Austria the organization is more centralized than in Germany. In May, 1917, a central office for the supply of foodstuffs was created and an association of war kitchens was formed to deal with the central office. The most important development has been in the middle-class kitchens, which have been kept entirely separate in administration from those run for a philanthropic purpose. The supply of food, particularly of flour, has been uncertain, but whether because of a greater lack of foodstuffs than in Germany or because of the method of central control is not clear. . . .

"Sweden, Norway, and Denmark first began communal feeding during the winter of 1916-17, when the shortage of fuel began. In the first two countries the pressure of unemployment has made public assistance in the matter of food necessary so that the price of meals generally is a little below cost.

"In Holland the kitchens, which were begun early in 1917, have not grown in popularity. This is accounted for largely by the fact that the people have been required to make a more radical change in their diet than have other neutral nations. The necessity of keeping up exports has forced the use of rice instead of potatoes and dried pulse in place of fresh vegetables. Since there is no great sympathy among the mass of the people with this policy and since the kitchens provide only the new war diet the people as a whole have been slow in patronizing them."

Food-borne infections, E. O. JORDAN (*Science, n. ser., 47 (1918), No. 1204, pp. 80-86*).—It is pointed out in this article that many of the gastro-intestinal disturbances commonly declared due to ptomaine poisoning are not due to the use of spoiled food containing ptomaine but to the presence of true bacterial toxins, comparable to the toxins of diphtheria and tetanus bacilli or to infection with specific bacteria borne in or upon the implicated food article. Of these, demonstrated instances of food poisoning due to bacterial products are not very numerous, but careful investigation of food poisoning outbreaks has shown a large number of instances of apparent poisoning which are in reality cases of infection with some pathogenic microorganisms. Hence the measures that need to be taken to prevent infection are of a different nature from those designed to prevent the use of food containing the products of bacterial growth. "Food-borne infections are essentially of two separate and quite independent classes: Those in which the pathogenic organisms are present in the food at its origin, without human intervention; and those in which the food has become contaminated from human sources during the process of preparation, transportation, or serving." . . . "The prevention of food-borne infection at present can be best effected by thorough heating, including especially milk pasteurization; employment of healthy persons for food preparation and serving; examination of food animals at or shortly before slaughter; general cleanliness of surroundings where food is prepared or served; use of food in a fresh condition."

ANIMAL PRODUCTION.

Some nutritive properties of corn, J. S. HUGHES (*Kansas Sta. Tech. Bul. 5 (1918), pp. 5-39, figs. 30*).—A study is reported of the vitamin content of corn and its relation to the inadequacies of corn to produce a normal growth.

Preliminary experiments showed that corn contains relatively large quantities of antineuritic substances by curing pigeons in which polyneuritis had been induced by feeding polished rice. A pair of pigeons remained normal for a year and gained slightly in weight on a diet of corn alone. In an experiment to study the distribution of accessories in the corn grain a pen of pigeons lost weight rapidly on a diet of polished rice and showed severe symptoms of polyneuritis in an average of 25 days. Another pen of pigeons on corn germs

lost weight somewhat less rapidly than those fed polished rice, and developed polyneuritis in an average of 28 days. One pigeon fed a ration of 75 per cent corn germs and 25 per cent corn bran remained normal for 50 days, with a slight gain in weight. Two pigeons fed pearl hominy, that is, corn with the germ and bran removed, lost weight rapidly and developed polyneuritis in 30 days. On the thirty-first day one of these pigeons was put on a diet of 80 per cent pearl hominy, 10 per cent corn germs, and 10 per cent corn bran. In 20 days it had reached a weight of 17 gm. more than its weight at the beginning of the experiment. The pigeons on polished rice and corn bran (3:1) gradually lost weight until one died on the one hundred and thirty-ninth day of the experiment. Corn germ was then added to the diet of one of the remaining pigeons, and it regained its lost weight and remained normal until the experiment was discontinued. With pigeons fed polished rice *ad libitum*, those receiving one grain of corn daily lost weight rapidly and developed polyneuritis in 35 days, those fed three grains of corn daily lost weight rapidly but did not develop polyneuritis, while those fed five grains daily lost weight very slowly, and those fed ten grains daily remained normal throughout the experiment.

A young fox squirrel fed on corn germs alone developed paralysis in the forelegs in 30 days, and died on the forty-seventh day. Another young squirrel, which had remained normal for 50 days on ground corn, developed paralysis in the legs in 23 days when its diet was changed to corn germ.

Chickens fed milo maize alone developed polyneuritis, and a few grains of corn were sufficient to cause marked improvement. Young chickens fed *ad libitum* on a diet of corn and a synthetic salt mixture gained at the rate of 1.2 gm. per head daily for 100 days. They were then forced to eat about 60 gm. per head daily of the same diet, on which amount they gained 6.3 gm. Their development was abnormal, and at six months of age it was hard to distinguish the sexes. Chickens fed corn and the salt mixture supplemented with casein extracted with alcohol gained much more rapidly than those fed corn alone, but not quite so rapidly as those fed corn and unextracted casein.

A lot of chickens was fed corn, salt mixture, and casein extracted with alcohol and ether. Two of the chickens died and the third gained only 425 gm. in 14 weeks. At the end of this period 10 per cent of milk fat was added to the diet, and a marked increase in weight followed.

In another series of three experiments the effect of autoclaving casein for two hours each at 15, 30, and 45 lbs. pressure was studied. In these experiments enough casein was added to make 4 per cent nitrogen in the diet, which also contained 5 per cent of the synthetic salt mixture. In the first experiment five lots of three Plymouth Rock chickens were used. Lots 1 to 4 were fed corn and salt mixture, and in addition lot 2 was fed crude casein, lot 3 casein autoclaved at 15 lbs., and lot 4 casein autoclaved at 30 lbs. Lot 5 was fed a mixture of corn meal, bran, meat meal, oyster shell, and charcoal. The most rapid growth, aside from lot 5, was made by the chickens receiving casein autoclaved at 15 lbs. Those fed casein autoclaved at 30 lbs. gained fairly well for six weeks and then ceased to grow. In this experiment the chickens in lot 3 developed secondary sexual characters much more rapidly than those in lot 2. There was an abnormal development of leg bones of the chickens in lot 3. The next experiment was planned to induce more exercise on the part of the chickens. The results indicate that the abnormal leg development was not due to lack of exercise. The chickens fed casein autoclaved at 30 lbs. showed an eczematous condition of the skin and ruffled feathers, indicating an inadequate diet. In the third experiment the casein in the diet of lot 1 was not autoclaved. In lots 2, 3, and 4 the casein was autoclaved at 15, 30, and 45 lbs. pressure, respectively, for two hours. Milk fat was added to the diet of

two chickens in lots 3 and 4 after the tenth week. The results again showed that casein autoclaved at 15 lbs. was about as efficient as crude casein. Casein autoclaved at 30 lbs. was less efficient than that autoclaved at 45 lbs. and much less efficient than the crude casein. The addition of milk fat to the diet caused only a slight increase in the rate of growth, but resulted in a great improvement in the general appearance of the chickens.

In order to determine whether or not autoclaving casein diminishes its efficiency to promote growth when it is the only protein in the diet, an experiment was conducted with rats, in which the diet was adequate in respect to the food accessories and ash. These substances were supplied by milk fat, protein-free milk, and ash. No appreciable difference was observed in the rate of growth of rats due to autoclaving the casein.

Some observations were made upon the abnormal bone development of the chickens used in these experiments. An X-ray examination of these abnormal bones showed that autoclaving the casein destroyed some substance which was essential to the proper development of the bone. The abnormal bones were much larger in diameter, but had a much smaller breaking strength than normal bones.

A bibliography of 26 titles bearing on these diet-essential substances is included.

Feed registration under the Kansas feeding stuffs law, L. A. FITZ and A. E. LANGWORTHY (*Kansas Sta. Insp. Circ. 5 (1917), pp. 63*).—This circular explains the purposes and scope of the State feeding stuffs law and gives instructions in reference to registering feeding stuffs and otherwise complying with the law. The results of the inspection of feeding stuffs during the years 1915-16 and 1916-17 are summarized, including tabulated analyses of corn chop, corn bran, gluten feed, Kafir corn chop, barley chop, bran, shorts, red dog flour, rye middlings, cottonseed meal and cake, cottonseed feed, linseed meal, hominy feed, dried beet pulp, sugar beet meal, alfalfa meal, ground alfalfa straw, tankage, meat scrap, meat meal, and mixed and proprietary feeds. The feeds that have been registered up to September 1, 1917, for the fiscal year 1917-18 are listed.

Inspection of feeding stuffs, A. W. CLARK ET AL. (*New York Sta. Bul. 441 (1917), pp. 585-691*).—Analyses are given of cottonseed meal, linseed meal, malt sprouts, distillers' dried grains, brewers' dried grains, corn gluten feed and meal, hominy feed, animal products, alfalfa meal, wheat bran, wheat middlings, corn germ meal, corn feed meal, screenings, barley middlings, red dog flour, coconut meal, dried beet pulp, and mixed and proprietary feeding stuffs.

Analyses of commercial feeding stuffs, P. H. WESSELS and G. E. MERKLE (*Rhode Island Sta. Insp. Bul., 1918, May, pp. 3-12*).—Analyses are reported of the feeds that were found on sale in Rhode Island during the past year, including cottonseed meal, linseed meal, gluten meal and feed, dried brewers' grains, wheat bran, hominy feed, alfalfa meal, meat scrap, dried beet pulp, rye middlings, wheat middlings, and mixed and proprietary feeding stuffs.

[Feeding experiments with beef cattle], **D. T. GRAY** (*North Carolina Sta. Rpt. 1917, pp. 45-48*).—In testing the effect of continued feeding of cottonseed meal to breeding animals two or three heifers have dropped normal calves after being fed daily 1 lb. of cottonseed meal per 100 lbs. live weight during the summer and 12 lbs. per head in winter. A progress report of a comparison of velvet bean meal and cottonseed meal for silage-fed beef cattle indicates that it takes 7 lbs. of the velvet bean meal to produce as much gain as 5 lbs. of cottonseed meal.

The cooperative work with wintering steers and yearlings in Haywood County was continued (E. S. R., 37, p. 675). Lot 1 on 2 lbs. of corn and 10

lbs. of hay per head daily lost 35 lbs. per steer during the winter; lot 2 on 15 lbs. of silage and 7 lbs. of corn stover and straw lost 52 lbs. per steer; lot 3 on the same ration as lot 2 lost 76 lbs. per steer; lot 4 on pasture alone lost 18 lbs. per steer; and lot 5 on pasture alone lost nothing in weight. These cattle were turned on pasture the following spring and made the following average gains per head daily without additional feed for 140 days: Lot 1, 2.23 lbs.; lot 2, 2.5 lbs.; lot 3, 2.23 lbs.; lot 4, 2.38 lbs.; and lot 5, 2.48 lbs. On the same farm a lot of breeding cows was wintered on a ration of 2 lbs. of cracked corn, 2 lbs. of cottonseed cake, and 16 lbs. of corn stover and straw. The two other lots in this test were fed the above ration except that 3 lbs. of cottonseed cake was used. These cows were maintained on pasture alone the following summer. With corn at \$1 a bushel, cottonseed cake at \$35 and stover and straw at \$10 a ton, and pasture at \$1 per month per cow, the annual cost of maintenance varied from \$24.66 to \$27.51 per cow.

The study of the cost of wintering steers was continued at the Iredell substation. One lot of steers was fed a daily ration of 15 lbs. per head of corn silage, 10 lbs. of corn stover, and 1 lb. of cottonseed meal; and a second lot, 25 lbs. of corn silage and 1 lb. of cottonseed meal. During the latter part of the experiment the supply of silage became exhausted, and other feeds were substituted. The cost per steer from January 13 to April 24 was \$10.14 for lot 1 and \$10.29 for lot 2, with cottonseed meal valued at \$42.50, corn silage at \$4, corn stover \$8, cottonseed meal \$20, and straw at \$10 per ton. The steers in lot 1 gained 0.42 and those in lot 2, 0.39 lb. per head daily. During the test 35.5 tons of manure was produced. This experiment confirms earlier results, indicating that dry feed is essential for silage-fed cattle. The steers fed silage alone were losing weight rapidly until stover was added, after which they increased in weight rapidly.

At the Edgecombe substation a lot of steers gained an average of 2.05 lbs. per head daily from January 10 to May 9, 1917, on a ration of 9 lbs. of peanut meal and 25 lbs. of corn silage, while another lot gained 1.83 lbs. per head daily on a ration of 9 lbs. of peanut meal, 15 lbs. of corn silage, and 10 lbs. of corn stover. The steers were in excellent condition at the close of the test. The 24 steers in the two lots cost 7 cts. a pound in the mountains and sold at 9.5 cts. on the farm and returned a profit of \$71.26. Peanut meal was valued at \$35, silage at \$4, and stover \$8 a ton. The value of the manure was not included.

[Feeding experiments with steers], A. BOSS (*Minnesota Sta. Rpt. 1917, pp. 84-86*).—A carload of 30 steers were fed at the Waseca substation for 119 days during the winter of 1916-17. These steers were put on pasture in October and gradually brought on to a ration of corn silage and clover hay. A small amount of bundle corn was also fed during the early part of the winter. These steers gained an average of 0.96 lb. per head daily and consumed 2.5 lbs. of grain per pound of gain. Crediting the steers with \$54 for pork produced, they returned a profit of \$8.47 per head.

Care and management of sheep in Kentucky, E. S. GOOD and L. B. MANN (*Kentucky Sta. Bul. 215 (1918), pp. 5-63, figs. 13*).—The object of this bulletin is to give the results of a survey of sheep conditions in Kentucky, and to describe the best methods in use by practical sheep men, and the results of successful experimental work adaptable to Kentucky conditions. The data presented upon the methods and cost of handling sheep were secured for the most part in answer to questionnaires sent to a large number of sheep raisers in 39 counties situated in different sections of the State. A brief description is given of the principal breeds of sheep found in Kentucky. In addition to detailed directions for flock management, notes are given on the obstacles to

successful sheep raising. The need for the development of the industry in the State is pointed out. The text of the new State dog law is appended.

Are sheep profitable in Maine? C. D. Woods (*Maine Sta. Bul.* 269 (1918), pp. 3-8).—This is a progress report of work with the flock of grade sheep at the Highmoor farm (E. S. R., 37, p. 676), together with a summary of the three years the experiment has been running. For the 12 months ended October 31, 1917, the inventory of the 90 head of sheep and lambs and expenditures for labor, feed, etc., amounted to \$1,165.85. The receipts and inventory, not including the value of 40 tons of manure, with swine, amounted to \$1,301.74. During the year the 67 ewes gave birth to 79 lambs, of which 74 were vigorous and were raised. The wool clip averaged 6.3 lbs. for the entire flock and sold for 65 cts. per pound. It is estimated that the manure produced by the flock during the year was worth from \$250 to \$300.

Sheep, D. T. GRAY (*North Carolina Sta. Rpt.* 1917, pp. 49, 50).—In studies of the effect of cottonseed meal upon the breeding qualities of sheep, the work has not reached definite conclusions, but so far no harmful effects have been noted. At the Iredell substation 90 per cent of the lambs were successfully carried through the summer on stomach-worm infested pastures supplemented with 1 lb. of grain per head daily.

One lot of grade yearling ewes was wintered on a ration of 0.5 lb. of grain per head per day with the run of a good pasture in suitable weather. A second lot received a ration of 0.5 lb. of grain plus corn silage in a dry lot. During the 142 days the ewes on pasture lost less weight than those on dry lot, the cost per ewe being \$2.98 in the former lot and \$3.75 in the latter. The ewes were suckling lambs during the latter part of the winter.

[Feeding experiments with pigs], C. W. GAY and E. C. HIGBIE (*Minnesota Sta. Rpt.* 1917, pp. 46-48, 78, 79).—During the summer of 1916 the cost of gains with 25 pigs from weaning time to 170 lbs. average weight was about 4.25 cts. per pound, with corn at 50 cts. per bushel, tankage at \$55 per ton, and pasture at \$10 per acre. For 57 fall pigs the feed cost of gains from weaning time to 191 lbs. average weight was 5.32 cts. per pound, with corn and tankage at the above prices and shorts at \$32 per ton.

Three lots of market pigs were fed on alfalfa pasture for 105 days, and five lots of pigs a month younger than the alfalfa lots were fed on rape pasture for 85 days. The rations were, respectively, 3 per cent, 4 per cent, and self-fed corn on alfalfa; 3 per cent ground barley, 3 per cent, 4 per cent, self-fed corn, and self-fed corn and tankage, on rape. The average final weights per pig were 130.3, 162.4, 165, 103.5, 103.8, 130.16, 115.5, and 145.7 lbs., respectively. With grain costing \$1.50 per bushel, tankage \$75 per ton, and pasture \$10 per acre, the feed costs of gains were, respectively, 10.15 cts., 10.17, 10.75, 14.79, 9.72, 9.01, 9.61, and 9.51 cts. per pound. Total pork production (grain and pasture) ranged from 1,591.5 lbs. to 4,183.2 lbs. per acre. Pastures made a net saving of 0.93 to 1.68 cts. per pound of gain, when checked with balanced grain rations in the dry lot.

Five lots of fall pigs were fed for 147 days, lots 1, 2, and 5 being self-fed and lots 3 and 4 hand-fed. All the lots were fed shorts and tankage, and in addition lots 1, 3, and 4 were fed shelled corn, lot 2 ground barley, and lot 5 shelled corn and barley. The average daily gains per pig were, for lots 1 to 5 inclusive, 1.17, 1.01, 0.86, 0.85, and 1.04 lbs., respectively; and the amounts of grain required per pound of gain, 4.54, 5.12, 4.59, 4.57, and 4.54 lbs., respectively. A group of pigs from pasture lots receiving 3 per cent grain rations and another group from those fed on heavy grain pasture were turned on to field corn at the close of the pasture season. Both groups were practically equal in economy of gain on the corn. In a cooperative experiment under farm conditions 129

pigs made 4,160 lbs. of gain from 6.8 acres of flint corn and 32 barrels of buttermilk, or a gain of 611.7 lbs. per acre.

At the Morris substation spring pigs ranging in age from 9 to 12 weeks were divided into four groups of 15 each and put in various lots on June 10 and taken out September 19. Two groups were on alfalfa pasture and two in dry lots. They were fed a ration consisting of 70 per cent ground barley, 20 per cent flour middlings, and 10 per cent tankage. One alfalfa group and one group in dry lot were fed by hand and the other two groups were given the use of the self-feeders. The profit per pig was \$2.63 in the dry lot, hand-fed; \$3.41 in the dry lot with the self-feeder; \$3.57 with the alfalfa hand-fed group; and \$4.04 with the alfalfa self-feeder group. The average gain was from 0.9 to 1.1 lbs. per day.

Swine, D. T. GRAY (*North Carolina Sta. Rpt. 1917, pp. 33-43*).—A lot of pigs on soy bean pasture with no supplementary feed gained twice as rapidly for three months as another lot fed corn and shorts (2:1) on dry lot. With corn at \$45 and shorts at \$38 a ton and soy bean pasture at \$10 an acre the feed cost per pound of gain was 5.5 cts. for the soy bean pasture lot and 13.24 cts. for the dry lot. In this test the soy beans produced 200 lbs. of pork per acre. At the main station 2.6 acres of soy beans with an average yield of 15 bu. per acre furnished grazing without supplementary feed for 8 dry brood sows for 49 days during the fall after permanent Bermuda pastures were worthless, and the sows gained an average of 17 lbs. each.

The work with cottonseed meal for hogs (*E. S. R., 37, p. 679*) was continued without definite results during the year.

At the Edgecombe substation during the early fall of 1916, 32 pigs averaging 63 lbs. each were divided into three lots and fed as follows: Lot 1 corn and shorts (2:1) on dry lot, lot 2 soy bean pasture and a half ration of corn and shorts, and lot 3 soy bean pasture alone. During the soy bean pasture period (105 days) lot 1 gained an average per pig of 0.36 lb. daily; lot 2, 0.49 lb.; and lot 3, 0.14 lb. With corn at \$1 per bushel, shorts at \$38 a ton, and soy bean pasture at \$10 per acre, the cost per pound of gain was 17.89 cts. for lot 1, 9.37 cts. for lot 2, and 19.2 cts. for lot 3. In a cooperative experiment on the Cotton Valley farm near Tarboro 185 pigs, averaging 50 lbs., made satisfactory gains from September 26 to December 29, 1916, on soy bean pasture supplemented with corn. With corn at \$1 per bushel and soy bean pasture at \$8 per acre, these pigs produced gains at 6.29 cts. per pound.

Continuing the comparison of soy bean and peanut pastures for pigs at the Pender substation, an experiment with three lots of pigs was carried on for 84 days during the fall of 1916. Lot 1 was fed corn and shorts (2:1) on dry lot, lot 2 a half ration of corn and shorts on soy bean pasture, and lot 3 a half ration of corn and shorts on peanut pasture. The average daily gains per head were 0.35 lb. for lot 1, 0.48 lb. for lot 2, and 1.41 lbs. for lot 3. With corn at \$40 and shorts at \$36 a ton and soy bean and peanut pasture at \$10 an acre, the cost per pound of gain was 22.68 cts. for lot 1, 10.77 cts. for lot 2, and 5.9 cts. for lot 3.

In the study of the cost of raising pigs to weaning age data have been obtained with 45 sows and their litters. The cost to weaning time, including the cost of keeping the dams, was \$2.24 per pig at the Iredell substation, \$3.10 at the Pender substation, \$2.04 at the Edgecombe substation, and \$3.18 at the Cotton Valley farm.

At the Pender substation \$66.92 more was received from the meat of 9 hogs which was cured on the farm than from 9 hogs sold immediately after killing. This includes the returns from the lard, heads, ribs, trimmings, etc., which

were sold fresh. Two different methods were used in curing the meat. One-half was put down in dry salt and the other half in a brine mixture made of 12 lbs. of salt, 3 lbs. of brown sugar, 3 oz. of saltpeter, and 6 gal. of water to each 100 lbs. of meat. The curing period lasted 27 days, and during this time the meat in the brine shrank in weight 3.4 per cent, while that in the dry salt shrank 7.5 per cent. After the meat was taken out of the curing materials, one-half was cured with liquid or prepared smoke and the other half was cured in the old-fashioned way, with hickory smoke. The smoking period lasted 27 days. At the end of this time all of the meat was wrapped in paper and cheesecloth and allowed to hang in the smokehouse for 34 days and then sold. When the meat was unwrapped to be sold it was found that the fat and lean had separated to some extent on the meat that was smoked with liquid smoke, while that treated with hickory smoke had not. The meat which had been treated with hickory smoke also had a better appearance and sold much more readily. There was no noticeable difference, however, in the internal appearance of the meat or in the taste after it was cooked.

In order to test the profitableness of feeding to harden the bodies of hogs fed on peanut and soy-bean pastures work has been carried on at the Pender and Edgcombe substations and the Cotton Valley farm. It has been found in general that even when buyers fail to respond with increased prices for hard-bodied hogs it pays to feed hardening rations for a period of not more than 35 days after the grazing period. The following table shows the results obtained at the Cotton Valley farm in a finishing period of 26 days with nine lots of 20 soft-bodied hogs each:

Finishing soft-bodied hogs.

Lot.	Ration.	Average daily gain.	Feed required per 100 pounds gain.			Cost per pound of gain.
			Corn.	Cottonseed meal.	Tankage.	
		<i>Pounds.</i>	<i>Bushels.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Cents.</i>
1	Shelled corn.....	1.7	7.1	.....	.....	12.40
2	Shelled corn and cottonseed meal.....(9:1)...	1.8	6.5	40	.....	13.80
3	Do.....(7:1)...	1.6	6.8	55	.....	14.70
4	Do.....(4:1)...	1.5	8.5	119	.....	19.38
5	Do.....(3:1)...	1.4	6.0	112	.....	14.21
6	Cracked corn and cottonseed meal.....(2:1)...	1.9	5.6	153	.....	14.32
7	Do.....(3:1)...	1.1	4.7	86	.....	11.12
8	Ear corn and cottonseed meal.....(9:1)...	1.9	9.8	61	.....	20.82
9	Shelled corn and tankage.....(9:1).....	.....	6.3	.....	29	14.16

In this test corn was valued at \$2 a bushel, cottonseed meal at \$40 a ton, and tankage at \$80 a ton.

In the investigations upon the effects of peanuts, soy beans, and mast upon the melting point of the fat and lard of hogs fed thereon, the results seem to show that soy-bean meal and peanut meal do not make soft-bodied hogs. At the Edgcombe substation the experiment was conducted with 33 pigs raised on the substation farm. The average melting point of kidney fat from three of these pigs at the beginning of the test was 38.5° C. The 30 remaining pigs were fed in three lots, in small bare pens, as follows: Lot 1 was fed the whole period, January 26 to June 26, a ration of corn and wheat shorts (2:1), lot 2 corn and damaged peanuts (2:1), and lot 3 corn and peanut meal (2:1). At the end of the test the melting points of the fat were 39.1° for lot 1, 36° for lot 2, and 38.3° for lot 3. At the beginning of a similar test at the main station the average melting point of samples of fat from three pigs slaughtered from

the experimental group was 41.1°. The remaining 28 pigs were fed in three lots in small pens the same rations as the respective lots in the test at Edgcombe except that the corn was cracked and soy-bean meal was fed in place of damaged peanuts to lot 2. At the end of the test the average melting points of samples of fat were 41.9° for lot 1, 42° for lot 2, and 42.1° for lot 3. At the Cotton Valley farm the kidney fat of hogs fattened on corn alone had a melting point of about 43°, whereas the fat of hogs fed on soy-bean pasture melted at 28.6°. A lot of 40 of these soy-bean pasture hogs was finished for 48 days in dry lot on a ration of corn, cottonseed meal, and peanut meal. At the end of this period the melting point had been raised to 44.2°. At the Edgcombe substation hogs fattened on soy bean pasture showed a melting point of 31.5°. After finishing for 36 days on corn and shorts the melting point of the fat averaged 39.2°. The results so far indicate that nothing is comparable to cottonseed meal for hardening soft hogs.

[Grazing experiments with pigs], C. M. EKLOF and F. H. LAFRENZ (*Idaho Sta. Bul. 104 (1918), pp. 44, 48*).—Grazing experiments at the Caldwell substation were continued during the year (E. S. R., 37, p. 68), five different crops being used in the hogging-off work. On 2 acres of alfalfa 25 pigs lost 83 lbs. in weight per acre in 62 days. There was a gain of 275.2 lbs. on peas, 1.5 acres of which furnished grazing to 33 pigs for 17 days. One acre of peas and wheat grazed 33 pigs for 14 days and produced 366 lbs. of pork. On 1 acre of wheat 32 pigs gained 418 lbs. in 15 days. One acre of corn produced 275 lbs. of pork and furnished forage to 32 shoters for 7 days. With pork at 14 cts. per pound the peas were worth \$38.53 per acre, peas and wheat \$51.25, wheat \$58.50, and corn \$38.50. It is noted that the greatest loss in the alfalfa lot was sustained by the 10 largest and fattest pigs in the lot.

At the Sandpoint substation $\frac{3}{4}$ of an acre of field peas furnished grazing for 3 Berkshire shoters from September 15 to October 7 and produced 84 lbs. of pork, or a value of \$19.68 per acre with pork at 16 cts. per pound.

Dairy by-products v. tankage for fattening swine, H. E. DVORACHEK (*Arkansas Sta. Circ. 38 (1918), pp. 4*).—This is a brief summary of experiment 5 of a series of experiments already noted (E. S. R., 36, p. 768).

Are swine profitable in winter? C. D. WOODS (*Maine Sta. Bul. 269 (1918), pp. 1, 2*).—In continuation of the experiment of keeping manure worked over and compacted by swine (E. S. R., 37, p. 680) 16 8-week-old pigs costing \$3 each were kept in the manure pit from November 5, 1916, to May 21, 1917. In general, the pigs were fed cooked turnips in addition to ground feeds and an occasional feed of corn on the ear. The entire cost, including purchase price of pigs, \$121.80 for feed, and \$17.50 for labor, was \$187.30. At the end of the experiment the pigs were sold for \$218.40. It is estimated that the value of the manure produced by the pigs was sufficient to cover charges for investment and upkeep.

[Cottonseed meal for work horses and mules], D. T. GRAY (*North Carolina Sta. Rpt. 1917, pp. 54, 55*).—At the Edgcombe substation six mules have been fed in two lots since February 1, 1915, rations of corn and either corn stover or cowpea, crab grass, Sudan grass, or soy-bean hay. The three mules in lot 2, which are team mates of the mules in lot 1, received in addition to the corn about 1 lb. of cottonseed meal per head daily. Each mule in lot 1 consumed an average of 69.9 bu. of corn per year, worked 158 hours per month, and lost 50 lbs. in weight during the 29 months of the experiment. During the same period each mule in lot 2 consumed 61.6 bu. of corn and 296 lbs. of cottonseed meal per year, worked 149 hours per month, and lost 40 lbs. in weight. Similar results have been obtained at the Iredell and Pender substations. In these tests 1 ton of cottonseed meal has saved 56 bu. of corn at the Edgcombe sub-

station, 11.2 bu. of corn and 10.17 bu. of oats at the Iredell substation, and 34.4 bu. of corn at the Pender substation. See also a previous note (E. S. R., 37, p. 681).

[Report for 1917 of] Kansas State Live Stock Registry Board, C. W. McCAMPBELL ET AL. (*Kansas Sta. Insp. Circ. 6 (1917), pp. 3-159*).—A review of the improvement of public-service stallions in the State shows the changes that have taken place since 1910 when the stallion license law went into effect. Brief articles are included on causes and prevention of colt losses, hereditary unsoundnesses in horses, hints on the care and feeding of horses, and raising orphan foals. The text of the State law relative to the registration and licensing of stallions is given. The stallions registered during 1917 are listed by counties and breeds.

Poultry investigational work, D. T. GRAY and B. F. KAUPP (*North Carolina Sta. Rpt. 1917, pp. 55-57, 58-63*).—In poultry investigational work of the station during the year, peanut meal has been successfully used along with other feeds for raising chickens at the Edgecombe substation. The experimental ration was made up of equal parts of peanut meal, ground oats, and corn meal, plus buttermilk. At the end of eight weeks one lot of chickens on this ration averaged 1.3 lbs. in weight, another 1.2, and a third 1.4 lbs.

In testing the value of milk for raising chickens, one lot, at the Iredell substation, fed on rolled oats, corn meal, wheat bran, and water, and in addition, after the fourth week, a grain mixture of wheat, oats, and cracked corn, weighed only 0.2 lb. each at eight weeks. They were attacked by diarrhea which caused a high death rate. A second lot on the same ration weighed 0.25 lb., and a third, 0.22 lb. at eight weeks of age. At the same time, check lots of chickens at the Pender and Edgecombe substations were fed rations similar to the above except that milk replaced the water in the mash. At eight weeks of age the milk-fed lots averaged from five to six times as much in weight as the no-milk lots.

At the Edgecombe substation four lots of young chicks on a ration of soy bean meal, wheat shorts, and corn meal, equal parts by weight, plus sweet milk, averaged, at eight weeks of age, 1.4, 1.3, 1.6, and 1.5 lbs. per chick, respectively. Another lot handled and fed as above, except that rolled oats replaced the soy bean meal, averaged 1.1 lbs. each at eight weeks.

A lot of 32 Buff Plymouth Rock hens on range laid 2,651 eggs last year. The same number of hens in a dry lot and fed the same ration as those on range laid only 314 eggs.

The work on the effect of feeding cottonseed meal to laying hens (E. S. R., 37, p. 681) has been continued. To date, the mortality rate has been 34 per cent in the pens receiving either 30 per cent or 5 per cent of cottonseed meal and 20 per cent in the pen receiving no cottonseed meal. In another series of experiments in which different pens received rations containing 1, 5, and 10 per cent of cottonseed meal, respectively, the mortality has been unusually high. In a third series of experiments the attempt is being made to make the rations so palatable and complete that the bad effects of cottonseed meal will not appear. Very good results have been obtained with rations made up of (1) cottonseed meal, whole milk powder, and ground corn (2:1:2); (2) cottonseed meal, meat meal, ground corn, wheat bran, ground oats, and skim milk (3:1:3:1:1:1); (3) cottonseed meal, wheat bran, ground oats, and ground corn (3:2:2:3).

Breeding work is being done, the principal object of which is to develop a flock of high-laying White Leghorns. White-shelled eggs were 8.7 per cent more fertile in 1916 and 14.7 more fertile in 1917 than brown-shelled eggs. When daughters were bred to their sires the fertility of the eggs was reduced

from 2 to 5 per cent and the hatchability of the eggs was reduced from 10 to 30 per cent, as compared with matings in which inbreeding was not practiced.

A study is being made of the effect of mineral matter upon the development of young chicks. In an experiment in shipping fat poultry to market, a lot of broilers fattened for 21 days on buttermilk and mash lost 11.3 per cent in weight in being shipped from Raleigh to New York City. A lot of hens fattened for 10 days on corn meal, wheat middlings, ground oats, and buttermilk were fed 4 oz. of whole corn and all the water they would drink just before leaving Raleigh for New York City. They shrank in weight 5.3 per cent. A third lot of fat hens that had been fed on mash and buttermilk and fed whole corn just before being shipped to the same market shrank 2.6 per cent in weight.

At the Iredell substation different lots of chicks fed a limited amount of buttermilk with the grain ration averaged from 0.05 to 0.35 lb. more in weight per chick at 8 weeks of age than those fed water with the grain ration. At the Pender substation three lots of chicks fed soy bean meal, ground oats, and corn meal, equal parts by weight, plus buttermilk, averaged 1.2, 1.3, and 1.13 lbs. per chick, respectively, at 8 weeks, whereas three lots fed the above grain ration with water in place of the buttermilk averaged 0.88, 0.75, and 0.76 lb. per chick, respectively.

[*Poultry husbandry studies*], P. MOORE (*Idaho Sta. Bul. 104 (1918), pp. 35, 36*).—The feeding experiment already noted (*E. S. R., 37, p. 70*) has been continued, and an additional pen, No. 8, has been added to determine the relative value of a ration the protein of which was from animal sources and the nutritive ratio intermediate between the wide and narrow rations of the preceding year. During the year pen 5 produced 60.13 per cent more eggs than pen 4, 61.26 per cent more than pen 6, 24.36 per cent more than pen 7, and 2.17 per cent less eggs than pen 8. The percentage of eggs under 2 oz. in weight was 32.02 for pen 4, 11.26 for pen 5, 34.67 for pen 6, 17 for pen 7, and 5.53 for pen 8.

As compared with the average price of feeds for the 10 years previous to July 1, 1915, the actual cost of feeding fowls as indicated by the cost of feeding pen No. 8 from November 1, 1916, to November 1, 1917, shows an increase of 57.8 per cent in the last two years.

Records from a Purdue farm flock, A. G. PHILIPS (*Indiana Sta. Bul. 211 (1918), pp. 3-12, figs. 5*).—Results are given of four years of an experiment being carried on to determine the egg production, income, costs, and profits that may be obtained from a flock of from 100 to 260 pullets maintained under ordinary farm conditions. During the first two years the White Leghorn fowls which were used in these tests had the range of 8 acres of corn except a few weeks after planting. During the other two years the lots were alternated between two 1-acre yards.

The basis of the feeding was the standard Purdue laying ration which consists of a grain ration of corn, wheat, and oats (10:10:5) and a mash of bran, shorts, and meat scrap (5:5:3.5). Grit, ground bone, and green feed were available at all times. About 50 lbs. of skim milk or buttermilk was considered equivalent to 3.5 lbs. of meat scrap. Very little wheat was fed during the last year. The average egg production per bird was 131 during experiment No. 1 (12 months), 124.3 during experiment No. 2 (11 months), 117.6 during experiment No. 3 (11 months), and 135.6 during experiment No. 4 (12 months). The income per average number of hens was \$2.78 in experiment No. 1, \$2.48 in experiment No. 2, \$2.51 in experiment No. 3, and \$4.10 in experiment No. 4. The profit per bird alive at the end of each test was 97 cts. in experiment No. 1, 65 cts. in experiment No. 2, 82 cts. in experi-

ment No. 3, and \$1.62 in experiment No. 4. The net per cent profit on investment varied from 29.5 to 74.2.

Poultry keeping in the city (*Connecticut State Sta. Bul.* 202 (1918), pp. 217-224, fig. 1).—This bulletin gives the experience of one of the station staff in keeping a small number of fowls for more than a year in the center of New Haven. The fowls were kept in a back yard too shady for growing vegetables but furnishing enough space for successfully rearing a few chickens. From 24 Rhode Island Red pullets purchased in December, 1916, and 24 White Leghorn pullets purchased in August, 1917, 2,313 eggs valued at \$114.99 were secured from December, 1916, to the end of 1917. In addition, \$35.62 worth of meat was furnished by the flock, and \$55 worth of fowls were on hand at the end of the period. The feed cost, exclusive of labor, during the year was \$57.40.

Suggestions are given for keeping poultry under city back-yard conditions.

Suggestions for increasing egg production in a time of high feed prices.—**Yellow color as an indication of egg production**, J. E. DOUGHERTY (*California Sta. Circ.* 197 (1918), pp. 7).—In order to test the efficiency of culling flocks of yellow-legged fowls on the basis of the amount of yellow pigment at certain seasons of the year in shanks, ear lobes, and vent, observations were made during the spring and summer of 1917 upon trap-nested White Leghorns. Considerable accuracy was found to exist in the color observations as compared with actual trap-nest performance. Shank color and beak color were found to be somewhat more reliable to use for summer culling and grading than vent color. Yellow color indications were found to be of the most value during June, July, and August.

A short bibliography is included.

Pedigreeing poultry, W. A. LIPPINCOTT (*Kansas Sta. Circ.* 67 (1918), pp. 16, figs. 10).—The pedigree system described, which has been developed during the last five years at the station, is designed to furnish the following information: (1) A record of matings; (2) a record of parentage, showing not only which chicks are produced by a given pen but which ones are the offspring of each individual hen in the pen; (3) a ready means of tracing ancestries; (4) the egg record of every female breeder used in each successive season, where high production is sought; and (5) a description of every breeder used in each successive season as long as pedigreeing is carried on, where the objective is high-class show stock.

Directions for the use of the system are outlined.

The prevention of breakage of eggs in transit when shipped in carlots, MARY E. PENNINGTON, H. A. MCALEER, A. D. GREENLEE, ET AL. (*U. S. Dept. Agr. Bul.* 664 (1918), pp. 31, pls. 8, figs. 12).—Results are given of two seasons' investigations of carlot shipments of eggs, starting from points in Texas to Minnesota and shipped to eastern markets, to ascertain the causes of damage to eggs in transit.

"It was found that when eggs were shipped in carlots, packed in good, well-made, standard cases, with new medium or heavier fillers and flats, with properly placed and suitable cushions at top and bottom, with cases tightly stowed and efficiently braced in the car, and the car handled in accordance with good railroad practice, especially when switching, the total damage referable to transit was less than 2 per cent.

"The size of the egg influences its safety in transit. Eggs which were longer than the cells of the fillers showed 3.71 per cent damaged. The eggs with lightly cracked or dented shells, but with membrane unbroken, showed a transit damage of 2.88 per cent, as compared with 1.77 per cent for eggs with sound shells. Applied to case lots of broken eggs, the increased liability to damage is

noteworthy. Applied to the 19 lightly cracked eggs in the rehandled and re-packed case of commerce, the additional damage, referable to checks and dents, is $\frac{1}{2}$ egg per case.

"Egg cases must be standard, symmetrically made with 5, or preferably 6, 3-penny cement-coated nails at each corner of the sides and bottom and at the center partition. While cottonwood, gum, and tupelo cases vary but little in strength, the cottonwood case has, on the whole, the greatest number of advantages.

"Medium fillers (3 lbs. 3 oz.) or heavier should be used. It is absolutely necessary that the filler be perfectly new. Even a short-haul shipment into the packing house should disqualify the filler for further use. Suitable cushions of excelsior, with a flat, should be placed on the top and bottom of the case. The quarter filler is strong enough, and it forms an even cushion. Corrugated board on the top of the case affords practically the same protection as the excelsior cushion, provided it takes up the slack.

"More damage occurs in the top layer of eggs than in the deeper layers of the case, and more in the ends than toward the center.

"When cars are buffed with straw at the bunkers there is a slight but clear rise in damage as the cases near the center of the car. There is also a progressively increasing breakage in the rows as they progress from the middle line to the side of the car. The location of layers is apparently immaterial. The load of eggs must be a solid unit in the car, fitting without play. This is the most important factor in avoiding damage in transit. Either the step-joint or straight-joint load may be used.

"The amount of damage in properly loaded cars buffed with straw is slightly less than in the same cars buffed with wood. When the straw buffing is placed at the bunkers and extends from the top of the load to the floor of the car, at least 50 per cent of the refrigeration is lost. Braces nailed to the car seldom arrive in place. They cause much damage. Self-bracing of the load by means of suitable strips placed below the cases is most satisfactory. Cars having steel underframes show a slightly greater amount of damage than those with wooden underframes.

"The shocks incident to ordinary freight-train handling while running seldom cause damage in well-stowed cars. The shocks incident to switching are sometimes destructive. More care should be exercised in switching cars containing eggs. While the haul in wagons or trucks between the railroad terminal and the warehouse or store may be responsible for some damaged eggs, the breakage is ordinarily not more than 1 cracked egg per case.

"By following good commercially practicable methods of packing, storing, and hauling eggs can be transported in carlots with a total damage of less than 2 per cent."

The installation and equipment of an egg-breaking plant, M. K. JENKINS (*U. S. Dept. Agr. Bul. 663 (1918), pp. 25, pls. 2, figs. 25*).—This bulletin gives conclusions with reference to economy in handling eggs based upon a study of frozen and dried eggs. Certain improvements in the distribution of space in egg-breaking plants are recommended, and new equipment devised to meet special requirements of the industry is discussed. Floor plans for plants are given, together with directions for the construction of egg-breaking and sterilizing rooms.

Two methods of preserving eggs, G. A. OLSON (*Washington Sta. Popular Bul. 114 (1918), pp. 4*).—This treats of the use of water glass and of surface coatings for the preservation of eggs.

DAIRY FARMING—DAIRYING.

The refinement of feeding experiments for milk production by the application of statistical methods, L. A. MAYNARD and W. I. MYERS (*New York Cornell Sta. Bul.* 397 (1918), pp. 213-249, figs. 2).—From a study of the prevailing methods of conducting feeding experiments the authors conclude that "the practical feeding trial still has its importance. Refined methods are, however, desirable. A more thorough knowledge and appreciation of the special variable factors involved in milk production is also essential. The continuous system of carrying out feeding tests would seem to be the more satisfactory method, provided the probable limits of variation over the experimental period can be ascertained. In selecting animals for an experiment the previous records and history of treatment and behavior should be consulted, in order that animals abnormal in these respects may be excluded. This selected group of animals should be fed the basal ration for a preliminary period and should receive for that period the same care and management as though on experiment. On the basis of production and behavior during the preliminary period, the selection and grouping of animals for the experiment should be made. The group selected for the preliminary period should contain a somewhat larger number of animals than will be required for the experiment, in order to allow a certain range in selection. In choosing animals for both the preliminary period and the experimental period, as many of the variable factors should be eliminated as is possible in consideration of the number of animals at the investigator's disposal. There will always remain a certain number of uneliminated factors, the probable limits of variation of which must be known for the intelligent interpretation of results. Thus, statistical data relative to the variation in milk production under various conditions of selection are needed."

A statistical study was made of the variation in milk production for the purpose of obtaining data needed for the intelligent planning of feeding experiments conducted under the continuous system. These data consist primarily of information as to the probable limits of variation over an experimental period of 18 weeks of individuals and groups selected on the basis of equal productive capacity as determined in a preliminary period. The material for the study was obtained from 30 years' records of the university herd, involving some 400 individuals of the Holstein-Friesian and Jersey breeds. The records of all animals that have been used in feeding experiments by the station were excluded.

Of 178 Holstein-Friesians in the same stage of lactation, selected on the basis of approximately equal production during a 2 weeks' period, the coefficient of variability ranged from 9.53 to 17.53 per cent for individuals in the different classes, the weighted average value for the 178 cows being 11.87 ± 0.43 per cent. Under the conditions of selection used, in which the 18 weeks' period was completed while the decrease in milk production due to advancing lactation remained approximately uniform, the cows being in different stages of lactation, the coefficient of variability was 12.11 ± 0.43 per cent. In a study of 112 Jerseys in the same stage of lactation the coefficient of variability was found to be 11.47 ± 0.53 per cent. With the Holstein-Friesian cows the coefficient of variability was 5.09 ± 0.42 per cent in 33 groups of 6 cows each, selected on a basis of 2 weeks' milk production of 3,200 to 3,299 lbs. for each group. Approximately the same variability was found in the Jersey cows. When the groups were made up of animals whose production during the 2 weeks' period checked within 50 lbs., the group variation for a like period being within 100 lbs., the coefficient of variability was 3.00 ± 0.41 per cent. Groups of cows of the same age were found to vary in production an average of 2.32 ± 0.51 per cent less than

groups of cows of different ages. In the ages studied the cows did not appear to be less variable at any particular age.

The coefficients of variability were found to decrease slightly but consistently, as the range in production allowed by group limits was narrowed from 100 to 10 lbs. However, the difference between the highest and lowest limits was not so great as its probable error.

Data as to the observed and calculated coefficients of variability of groups of 4, 6, and 8 cows indicate that the probable coefficient of variability of groups of different sizes may be safely computed from the coefficient of variability of individuals. When groups of cows were selected on the basis of yield during the preceding lactation period the average coefficient of variability was found to be 9.11 ± 1.05 per cent.

When groups were selected on the basis of approximately equal fat production, a range of 3.5 lbs. of fat for the preceding 2 weeks being allowed in the group limits, the coefficient of variability was found to be 5.13 ± 0.43 per cent. On the basis of selection used in this study, aborting cows were apparently less variable than normal cows.

A study was also made of the effect of age on the production of dairy cows. For this study records of the production of 79 cows were used, ranging in length from 4 to 11 lactations. The maximum milk production of these cows was not reached until the eighth lactation period. However, only 14 of the 79 cows had completed 8 lactations. The relation of age to fat production was found to agree very closely with the relation of age to milk production.

Suggestions are given for the application of the results of this statistical study.

The effects of high protein and high energy rations on feeding dairy cows, A. W. DRINKARD, JR. (*Virginia Sta. Rpt. 1917, pp. 32-34, fig. 1*).—From digestion trials completed since those already reported (*U. S. R., 39, p. 75*), it is noted that "the cow that received the high protein ration was consuming only 75 per cent of her ration, but this amount supplied her with sufficient energy and more than twice as much digestible protein (from average coefficients) as was necessary. The coefficients of digestibility of the protein, crude fiber, and fat were all slightly below the average, but a large amount of protein in excess of the requirements for maintenance and milk production was digested. The coefficient of digestibility for the nitrogen-free extract was slightly above the average. The cow that was fed the ration containing a large excess of energy consumed almost all of it, but it was found that the coefficients of digestibility of all the nutrients were reduced to a remarkable extent. The reduction of the digestibility of the protein, which, under normal conditions, was present only in sufficient quantity, caused protein starvation and consequent rapid loss of flesh when milk was being produced. The reduction of the digestibility lowered the energy of the digestible nutrients to an amount approximating the requirements for maintenance and milk production."

Dairy cattle, D. T. GRAY and W. H. EATON (*North Carolina Sta. Rpt. 1917, pp. 50-54*).—The work with onion contamination of milk (*U. S. R., 37, p. 682*) has led to the following conclusions: "It is possible to remove the flavor on a commercial scale by blowing a current of heated air through the milk for a length of time depending upon the degree of flavor. Molasses feeds have a tendency to slightly weaken the flavor. Onion flavor becomes more pronounced as the acidity of the milk increases. A slight onion flavor has been found in 2 per cent of the milk samples 20 minutes after onions were eaten; the climax of the flavor is reached in from two to two and a half hours, and the flavor naturally disappears in four to four and a half hours, provided the cow does not eat

more than 3 or 4 lbs. of onion tops. Only 2 per cent of the samples have been found to show a slight flavor at five hours after onion tops were eaten."

To safeguard against trouble from wild onions in pastures it is suggested that dry cows and calves should have the run of the onion pastures where possible. The cows should be fed heavily on molasses feeds with the grain mixture. Cows should be removed from onion pasture from two to five hours before milking.

In wintering experiments with dairy heifers, a lot of calves fed bran and cottonseed meal, half and half, plus corn stover, lost an average of 25 lbs. per head from October 1 to April 1, and the feed cost per calf was \$7.32. Another lot fed cottonseed meal and stover lost 54 lbs. per calf during the same period, the feed cost being \$7.55. These calves were continued on the same grain rations on rye pasture in the spring of 1917. With 1 lb. of grain and 1.5 lbs. of corn stover daily the calves in the first lot gained an average of 96 lbs. each in 61 days, while those in the second lot gained only $\frac{1}{2}$ lb. A lot of calves fed from May 1, 1916, to January 7, 1917, a ration of cracked corn, cottonseed meal, and wheat bran (3:1:1), plus hay and corn stover, gained 1.16 lbs. per head daily, while another lot fed the same ration, except that beet pulp replaced the cracked corn, gained 1.13 lbs. per head daily. It was found that beet pulp does not take the place of pasture for growing calves. During the past year at the Pender substation with grains at \$55, mixed hay at \$20, silage at \$4, and stover at \$10 a ton, and whole milk at \$2.50 and skim milk at 50 cts. per hundredweight it has cost \$8.18 to feed each calf to 3 months of age, and \$15.87 to feed each calf to 6 months.

Barrels proved efficient for coolers for cream held in shotgun cans on farms, a remarkable reduction being noted in the bacterial content of the cooled and uncooled creams. During the month of this experiment, September, 1917, the weather was unusually cool.

During August and September, 1917, the average temperature inside three iceless refrigerators was only 1.5° lower than the average mean atmospheric temperature.

The cost of milk production.—I, Factors of cost.—II, Application of the factors in determining the cost of milk at Northfield, Halstad, and Cokato, F. W. PECK and A. BOSS (*Minnesota Sta. Bul. 173 (1918), pp. 36, figs. 2*).—The records that furnish the basis for this publication were obtained from a study of an average of six farms in the vicinity of Northfield, Minn., from 1908 to 1912, seven farms near Halstad from 1912 to 1916, and eight farms near Cokato from 1913 to 1916.

Part 1 of the bulletin is a discussion of the various factors that enter into the cost of producing milk. The average annual production per cow was, in the Northfield area, 5,540 lbs. of milk and 190 lbs. of fat; in the Halstad area, 4,849 lbs. of milk and 205.6 lbs. of fat; and in the Cokato area, 4,944 lbs. of milk and 206.4 lbs. of fat. At Northfield the amount of feed required per 100 lbs. of milk was 19.1 lbs. of grain, 70.7 lbs. of roughage, 72.5 lbs. of silage, and 3 days of pasture. The corresponding figures for the Halstad locality were 18, 100, 61, and 2.8, respectively. In the Cokato region the feed consumed per 100 lbs. of milk was 22.6 lbs. of grain, 80.3 lbs. of roughage, including silage, and 3.5 days of pasture. The number of acres required to maintain a cow was 3.97 at Northfield, 3.83 at Halstad, and 3.73 at Cokato. The hours of man and horse labor per cow annually were 145 and 40, respectively, at Northfield, 160 and 17 at Halstad, and 132 and 34 at Cokato.

The application of the data in computing the cost of milk production is shown in part 2. On the basis of prices of January 1, 1918, for feeds and

labor, the following table gives the estimated cost of milk production in these localities:

Cost of milk production in three localities in Minnesota, Jan. 1, 1918.

Item.	Northfield.			Halstad.			Cokato.		
	Year.	Winter, November to April.	Summer, May to October.	Year.	Winter, November to April.	Summer, May to October.	Year.	Winter, November to April.	Summer, May to October.
Cost per cow:									
Feed.....	\$74.67	\$50.09	\$24.58	\$75.43	\$55.06	\$20.37	\$29.52	\$48.79	\$20.73
Labor.....	49.81	—	—	34.04	—	—	36.78	—	—
Miscellaneous.....	29.47	—	—	24.92	—	—	25.91	—	—
Supervision and overhead charges.....	14.49	—	—	13.44	—	—	13.22	—	—
Other costs less credits.....	—	29.88	29.88	—	23.70	23.70	—	25.47	25.46
Total.....	159.43	—	—	147.83	—	—	145.43	—	—
Credit.....	25.00	—	—	25.00	—	—	25.00	—	—
Net cost.....	134.43	79.97	54.46	122.83	73.76	44.07	120.43	74.26	46.19
Milk production per cow, pounds of milk.....	5,540	2,863	2,677	4,849	2,342	2,507	4,944	2,157	2,787
Cost of milk per 100 pounds.....	\$2.42	\$2.79	\$2.03	\$2.53	\$3.36	\$1.76	\$2.43	\$3.44	\$1.65

Milk contests in Michigan. W. GILTNER and L. H. COOLEGE (*Michigan Sta. Rpt. 1917, pp. 268-271*).—Milk and cream contests held during the year with dairy farmers and milk dealers at Highland Park, Grand Rapids, and Flint are briefly reported. A comparison of milk and cream scores made the first year with those made the second year shows the following results: In the 1916 Grand Rapids contest the 15 producers who also entered the 1917 contest had an average score of 84. These same producers had an average score of 91.9 in the 1917 contest. In the 1915 State fair contest were four who entered the 1916 Highland Park contest. These four had an average score of 89 in the 1915 contest and of 91 in the 1916 contest. Nineteen dairymen were found who entered two of the Flint contests. These 19 had an average score of 80.8 the first time entered and 83.3 the second trial.

[The bacterial flora of the udder and genital organs of the cow] (*Michigan Sta. Rpt. 1917, p. 280*).—In a study, by W. C. Keck, R. B. Bolton, and W. Giltner, of the bacterial flora of the vaginas of 30 cows and the uteri of 23 cows, 34 different organisms were isolated from the vaginas and 24 from the uteri. There were 52 different organisms isolated, 5 of which occurred in both uterus and vagina. There were no two cows which showed an identical flora in either the uterus or the vagina, and there was very little similarity in the bacterial flora of any two cows. Swabs were made from the sheath of several bulls, and of the 20 organisms isolated only one organism was found to occur in the sheath of bulls that did not occur in the uterus and vagina of cows. Of the organisms found, 22 forms were bacteria, 3 were bacilli, 11 were micrococci, and 4 were streptococci.

A comparative study, by M. Justo, of the bacterial flora of the udder and that of the genital organs of the cow showed no close similarity between the bacterial flora of these two sources. In 25 samples of milk examined only micrococci and streptococci were found. The author concludes that the normal bacterial flora of the udder is composed of these two types of microorganisms.

The control of bacteria in market milk by direct microscopic examination, R. S. BREED and J. D. BREW (*New York State Sta. Bul. 443 (1917), pp. 717-746, fig. 1*).—The work here reported consists in part of a comparison of results

secured by agar plate counts and by the microscopic method with 1,930 samples of milk supplied to grade A plants of one of the companies furnishing milk for the New York City market. Of 1,504 samples examined during February and March and graded as "A" or "B," 89.03 per cent of the ratings agreed by the two methods. During July 426 samples were examined and graded. The ratings by both methods agreed in 84.95 per cent of the cases. Many of the discrepancies noted in these gradings occurred in the case of samples which might be regarded as belonging to either grade; but there were occasional wide discrepancies which could not be so regarded.

Results are also given of the work of grading the milk supply of Geneva, N. Y., by the microscopic method, the findings being used as a basis of payment to the dairymen. This work began in February, 1915, and 11,851 samples of milk have been examined and graded. Counts have been made by both the microscopic and plate methods in 643 cases. Of these, 518 samples which showed fewer than 1,000,000 individual bacteria by the microscopic count developed fewer than 200,000 colonies per cubic centimeter; 58 samples which showed more than 1,000,000 and less than 10,000,000 individual bacteria developed between 200,000 and 1,500,000 colonies per cubic centimeter on agar; while 11 samples which showed more than 10,000,000 individual bacteria developed more than 1,500,000 colonies per cubic centimeter. If the limits which have been given are accepted as the limits between "good," "medium," and "poor" milk, then there would be an agreement in rating by the two methods in the case of 537 of the 643 samples (91.29 per cent).

This work was done by one man, who found it quite possible to handle from 50 to 70 samples daily. It is stated that no unexpected difficulties were met with in carrying out this system of grading, and very few complaints were received from the farmers.

Of 11,851 cans of milk graded, 10,166 were rated as good, 1,554 as medium, and 131 as poor. Of the samples examined, 2.91 per cent showed a predominant long-chain streptococcus flora of more than 1,000,000 per cubic centimeter, indicating that 20.47 per cent of all the trouble due to high-count milk was caused by udder trouble.

Using the microscope in milk grading, F. H. HALL (*New York State Sta. Bul. 443, popular ed. (1917), pp. 3-10, fig. 1*).—A popular edition of the above.

The control of public milk supplies by the use of the microscopic method, R. S. BREED and J. D. BREW (*Jour. Dairy Sci., 1 (1917), No. 3, pp. 259-271*).—The experimental work reported is included in the bulletin noted above.

Neutralized cream for butter making, W. GILTNER and C. W. BROWN (*Michigan Sta. Rpt. 1917, pp. 271, 272*).—A vat of sour gathered cream was divided into two parts, one of which was neutralized with lime, and each part pasteurized in a vat pasteurizer at 145° F. for 20 minutes and then cooled and chilled. The two divisions, after receiving an addition of about 10 per cent of starter each, were churned at the same time in separate churns. Three-lb. samples taken from the churns just before salting and others just after salting were placed in paraffined paper containers and set in storage at 32°. Data obtained from the products of this vat of cream are tabulated.

It is noted that the unsalted samples of butter at the end of storage showed a high content of acid, a large part of which was soluble in water. The proteoses and peptones were much higher in the unsalted than in the salted samples. The results indicate that butter from neutralized cream, although not showing uniformly greater changes, is less desirable for storage.

Cold storage of butter, H. H. KILDEE (*Minnesota Sta. Rpt. 1917, pp. 48, 49*).—A study was made of the influence of salt on the changes taking place in storage butter. The results indicate that salt affects butter by both the direct chemical

and the indirect biological routes. The effect of salt is to deteriorate butter when placed under temperature conditions which materially check bacterial growth, but on the other hand under conditions favorable to germ growth the action of salt is to inhibit such growth and thus preserve butter. Unsalted butter kept better at 10° F. than did salted butter. The deterioration, however, did not bear a close relation to the germ growth and strongly indicated that bacteria are not the immediate cause for such deterioration.

Bacterial flora of Roquefort cheese, ALICE C. EVANS (*Jour. Agr. Research* [U. S.], 13 (1918), No. 4, pp. 225-233).—A study was made in the Dairy Division of the U. S. Department of Agriculture of imported and experimental cheese to see whether cheese made from sheep's milk, according to the Roquefort way in France, differed significantly in its bacterial flora from cheese made in a similar way from cow's milk in America.

"The microorganisms essential for the manufacture and ripening of Roquefort cheese are *Streptococcus lacticus* and *Penicillium roqueforti*. *S. lacticus* decomposes the lactose during the manufacture of the cheese and thus produces the lactic acid necessary for the cheese making. These organisms disappear from the cheese after about two or three weeks, being killed by the high concentration of sodium chlorid. The remaining flora of Roquefort cheese consists of cheese streptococci and *Bacterium bulgaricum*, organisms which are found in all kinds of ripening cheese. These organisms do not have any significant part to play in the ripening of Roquefort cheese. The cheese slime consists of characteristic types of micrococci, rod forms, and yeast cells. The enzymes from the slime do not appear to be essential to the ripening of the cheese. The flora of both the interior and the slime of the experimental cheese was identical with the flora of the interior and the slime of the imported cheese. If the maker of Roquefort cheese will inoculate properly with *S. lacticus* and *P. roqueforti*, and provide the proper condition of manufacture and ripening, he need have no other concern about biological ripening agents."

A study of the streptococci concerned in cheese ripening, ALICE C. EVANS (*Jour. Agr. Research* [U. S.], 13 (1918), No. 4, pp. 235-252).—In the work here reported, which was done in the Dairy Division of the U. S. Department of Agriculture, the bacteriological differentiation between *Streptococcus lacticus* and two other species of cheese streptococci that have been recognized was studied. A few fundamental facts about the physiological activities of these streptococci and their relation to cheese ripening are pointed out.

"Streptococci that differ from *S. lacticus* are common in ripening cheese of various kinds, and in other foods prepared by fermentation. In this paper they are called cheese streptococci. It is probable that a study of the mouth, fecal, and udder types of streptococci will show that cheese streptococci belong to those familiar types. *S. lacticus* is described culturally and biochemically, and two other species of streptococci, Streptococcus X and *S. kefir*, are likewise described. The most pronounced biochemical characteristic which distinguishes *S. lacticus* from the other two species of streptococci described is the small quantity of acetic acid which it produces in milk cultures. *S. kefir* is notable among dairy streptococci because of its vigorous production of carbon dioxide when grown in suitable media.

"The experiments demonstrate that cheese streptococci modify significantly the flavor of pasteurized-milk cheese. Streptococcus X and *S. kefir* and another unclassified strain improved the flavor and hastened the softening of the curd of cheese made according to the Cheddar type from pasteurized milk. *S. kefir* and Streptococcus X also gave distinctive flavors to soft-cream cheese made of pasteurized milk."

The manufacture of casein from buttermilk or skim milk, A. O. DAHLBERG (*U. S. Dept. Agr. Bul. 661 (1918), pp. 32, figs. 9*).—A description is given of methods and equipment for the manufacture of casein from buttermilk and skim milk based upon experimental and commercial trials at the Grove City Creamery, Grove City, Pa. A study is reported of the effect of different factors upon the quality of buttermilk casein, carried on with samples from experimental lots. The important factors are the fat content of buttermilk, washing the precipitated curd, temperature of drying the ground curd, temperature of precipitating the curd, and acidity of the buttermilk. In tests of the comparative strength of different lots of casein it was found that in practically all instances casein from low-fat buttermilk was the stronger. Washing the curd of high-acid buttermilk invariably resulted in increased strength of the casein. No noticeable increase in strength could be detected due to washing the curd of the low-acid buttermilk. A temperature of 130° F. was found satisfactory for quick drying of the curd. A high drying temperature in combination with one of the other factors had an injurious effect upon the quality of the casein, which was most pronounced with a high-fat or unwashed curd.

In tests of the comparative strength of casein made from the same lots of skim milk by the ejector, sulphuric acid, and cooked curd methods, the ejector-method casein was found to be the strongest. The yields of dried casein averaged from 2.8 to 3.1 lbs. per 100 lbs. of undiluted buttermilk and from 3 to 3.25 lbs. per 100 lbs. of skim milk. The requirements for good casein and markets and prices for the product are discussed, and methods for determining the quality of casein are outlined.

VETERINARY MEDICINE.

Stock-poisoning plants of the range, C. D. MARSH (*U. S. Dept. Agr. Bul. 575 (1918), pp. 24, pls. 30*).—In a prefatory note J. R. Mohler calls attention to the fact that if stockmen and herders can recognize the stock-poisoning plants on the range and will act upon the information contained in the bulletins on the subject most of the losses will be avoided. This bulletin contains descriptive accounts of the important stock-poisoning plants, with directions for avoiding them and treatment of affected animals. Colored plates are given of many of the poisonous plants considered, including white loco or "rattleweed" (*Oxytropis lamberti*), *O. besseyi*, purple loco or Texas loco (*Astragalus mollissimus*), tall larkspurs (*Delphinium cucullatum* and *D. troilifolium*), aconite (*Aconitum columbianum*), low larkspur (*D. menziesii*), *Cicuta vagans*, death camas (*Zygadenus venenosus*), lupine (*Lupinus sericeus*), white laurel (*Azalea occidentalis*), wild cherry (*Prunus nana*), Colorado rubber plant or pingue (*Hymenoxys floribunda*, and western sneezeweed (*Dugaldia hoopesii*).

It is pointed out by the author that prevention should be largely depended upon and that but very little must be expected from medicinal remedies to reduce the losses from poisonous plants, although it is true that such remedies will help in the case of loosed animals and will save life in the case of larkspur poisoning of cattle.

Oak poisoning of live stock, C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr., Bur. Anim. Indus. [Pub.], 1918, pp. 3*).—This is a concise preliminary paper presenting the main results of a three years' investigation, of which a technical report is in preparation.

It was found that in the mountains of Utah there is a very distinct oak zone between the altitudes of 5,500 and 8,000 ft., in which the species known as *Quercus gambellii* is the principal form of vegetation. When cattle go to the summer range they graze through this region, at a time when the young leaves of the oak are appearing, and again late in the summer they frequently come

down from the higher ranges and stay in the oak zone, eating largely of the leaves. In Texas and New Mexico cattle are said to be poisoned by the "shinnery" oak (*Q. havardi*) in the early spring, this oak being one of the first plants to commence growing.

The authors' investigations have definitely proved that these oaks are the cause of the illness among cattle in these sections, though the number of cases of sickness is comparatively small, that in the "shinnery" country being estimated at 3 per cent. Extreme constipation is said to be perhaps the most noticeable symptom, which condition may be followed by diarrhea. The feces are passed infrequently, are dark and hard, consisting at times largely of mucus, and sometimes are bloody. The animal becomes gaunt, its coat rough, its nose dry and cracked, and the attitude is peculiar, the head being extended forward. The appetite is lost and weakness increases until the case is ended by death. The temperature and respiration are normal. These symptoms appear after a rather prolonged feeding upon the oak, not less than about a week. The animals may die in two weeks or they may linger for an indefinite period. In the autopsies the congested condition of the interior of the intestine and sometimes of the fourth stomach is most noticeable.

Treatment consists in relieving the constipation, as by administering Epsom salts in pound doses. Losses can be prevented by feeding a little longer and using the range only after the grasses have had a fair start. It has been found that where cattle are confined to pastures containing oak as small a quantity of feed as 3 lbs. of alfalfa hay daily with the oak will provide a maintenance ration for a 2-year-old steer and prevent the poisoning.

Forage poisoning due to *Bacillus botulinus*. R. GRAHAM (*Amer. Jour. Vet. Med.*, 13 (1918), No. 3, pp. 136-138).—This is a brief discussion of an outbreak of forage poisoning at Ottawa, Ill., which is said to resemble the disease affecting horses and mules for several years in Kentucky, reports of investigations in which State have been previously noted (*E. S. R.*, 38, p. 384). It is pointed out that the isolation of a pathogenic bacillus closely resembling *B. botulinus* from silage at Ottawa, Ill., as well as on two feeds in outbreaks some 200 to 300 miles remote, further suggests the possibility of the widespread character of this organism in nature as a primary agent in diseases resembling forage poisoning. The apparent prophylactic property of the serum offers some encouragement as an aid in controlling this type of fatal intoxication in animals.

Treatment of wounds (*Vet. Rev.*, 2 (1918), No. 2, pp. 190-193).—This is a summary of recent literature on various methods of wound treatment at present in use in military surgery, including controversial literature on the value of flavin as an antiseptic.

Iodin and some of the newer iodine preparations. H. J. MILKS (*Cornell Vet.*, 8 (1918), No. 2, pp. 101-106).—This is a general discussion of the various solutions of iodine and compounds of iodine for external and internal use.

It is concluded that the so-called soluble iodines are probably no more efficient than the tincture or Lugol's solution diluted to an equal strength.

The regulation of the manufacture and sale of veterinary biologic products by the Bureau of Animal Industry. J. R. MOHLER, A. R. WARD, and H. J. SHORE (*Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 7, pp. 828-850).—A paper presented at the annual meeting of the American Veterinary Medical Association, held at Kansas City, Mo., in August, 1917.

Annual report of the chief veterinary officer for the year 1916. S. STOCKMAN (*Bd. Agr. and Fisheries [London], Ann. Rpt. Chief Vet. Off.*, 1916, pp. 16).—This is the usual annual report (*E. S. R.*, 37, p. 687) dealing with the occurrence of and work with foot-and-mouth disease, hog cholera, glanders, anthrax, sheep scab, etc.

Studies on the blood proteins.—III. Albumin-globulin ratio in antitoxic immunity, K. F. MEYER, S. H. HURWITZ, and L. TAUSSIG (*Jour. Infect. Diseases*, 22 (1918), No. 1, pp. 1-27, pl. 1, figs. 5).—Continuing the studies previously noted (E. S. R., 37, p. 375), the authors report the results of investigations on the albumin-globulin ratio in the horse, dog, goat, and rabbit immunized with diphtheria, tetanus, and botulism toxins. They conclude that "the percentage of serum globulins increases markedly during the course of immunization with diphtheria, tetanus, and botulism toxins. In the case of botulism toxin, however, there is first an initial rise in the albumin fraction. No constant relationship is demonstrable between the percentage increase in the serum globulin and the antitoxic potency of the serum. The rise in globulins may be one manifestation of an upset in the delicate protein balance of the blood, resulting from the disturbed metabolism following the toxin inoculations."

A possible explanation of the behavior in the case of the botulism toxin is that the toxin may contain at least two toxic substances, one of which gives rise to an increase in the protein quotient while the other causes a depression of it. The depression of the quotient may be attributable to the nonspecific component of the toxin and the increase to the activity of a very active specific component.

The production of precipitins by the fowl, L. HEKTOEN (*Jour. Infect. Diseases*, 22 (1918), No. 6, pp. 561-566, fig. 1).—The author has used the method of Sutherland¹ to obtain precipitins in fowls for use in the identification of blood and other proteins. From the results obtained the following conclusions are drawn:

"The domestic fowl is a prompt, reliable, and liberal producer of precipitins, more so than the rabbit. A single intraperitoneal injection of 20 cc. of defibrinated blood or serum in most cases in from 10 to 12 days yields a precipitating serum of sufficient strength and specificity for practical purposes. On account of an unwelcome tendency to give nonspecific reactions, especially on rapid transfer from low to higher temperatures, great care must be exercised in all tests with fowl antiserum, and 1.8 per cent salt solution should be used in making all mixtures and dilutions."

Experimental researches on bacteriocatalysis, N. MORI (*R. Ist. Incoragg. Napoli, Ann. Staz. Sper. Malattie Infett. Bestiame*, 3 (1915), No. 1, pp. 3-51).—The author reviews the literature on the subject of bacteriocatalysis, and reports a series of investigations leading to the following conclusions:

Streptococci, glanders bacilli, and cholera vibrio give a positive reaction corresponding to the grade of their stability. From the results, combined with those of previous investigators, the conclusion is drawn that catalytic power, as shown by the ability to decompose hydrogen peroxid, is a general property of bacteria. A comparison of the catalytic power of related pathogenic bacteria, such as the bacillus of hemorrhagic septicemia and of human plague, of virulent and symptomatic anthrax, and of various strains of the enteritidis group, shows that the catalytic action can not be made the basis of differential diagnosis. Spore-forming bacilli give an appreciable catalytic reaction, weaker, however, than that of nonsporing bacilli. Contrary to others, the author thinks that the spores themselves can decompose hydrogen peroxid with greater or less intensity. Bacteriocatalysis is sensitive to drying, resistant to sunlight, and moderately resistant to heat and to disinfectants, such as 0.5 per cent phenol and 1 per cent mercuric chlorid. Duration of catalytic action varies with the substrate and the organism. With *Bacillus prodigiosus* and colon bacilli the

¹ Indian Jour. Med. Research, 3 (1915), No. 2, pp. 216, 217.

reaction may continue for 140 days, but with anthrax and typhoid bacilli and cholera vibrio it is destroyed in 4 days, whatever the substrate.

Further investigations upon the distribution of Gaertner group bacilli in domestic and other animals, W. G. SAVAGE (*Jour. Hyg. [Cambridge]*, 17 (1918), No. 1, pp. 34-50).—This is in continuation of investigations previously noted (*E. S. R.*, 30, p. 355).

"The examination of the spleens of 24 pigs and 10 calves and internal organs from 12 other pigs, all passed as healthy and fit for human consumption, failed to show the presence of any organisms belonging to the Gaertner group. One para-Gaertner bacillus was isolated in pure culture from the spleen of one of the calves. The spleens of the 24 pigs and 10 calves were also examined for the presence of aerobic organisms generally. Exactly half of the pig and half of the calf spleens were sterile, the remaining 50 per cent containing bacilli which were not completely identified but were mostly *Bacillus coli*, nonlactose fermenters allied to *B. coli*, streptococci, and staphylococci. All the organs were examined within a few hours of death. There was no correlation between interval since death and bacterial content nor any relationship to the age of the animal. The bacteria were evidently present in these organs at the time of death. . . .

The 48 rats examined were selected as showing no macroscopic evidence of Gaertner group infection and from none of them was a member of this group isolated, although five para-Gaertner strains were found which very closely resembled these bacteria."

Epizootic lymphangitis (*Trop. Vet. Bul.*, 6 (1918), No. 1, pp. 13-18).—A review of recent literature.

Observations on bird malaria and the pathogenesis of relapse in human malaria, E. R. WHITMORE (*Bul. Johns Hopkins Hosp.*, 29 (1918), No. 325, pp. 62-67).—"It appears that in *Proteosoma* the usual thing is for the bird to develop a chronic infection which may last at least 29 months; that all stages of the asexual cycle are found in the peripheral blood as long as any parasites are found there; that the parasites are constantly present in the peripheral blood for at least 29 months in a form that will transmit the infection by the injection of blood; that relapse occurs as a result of lowered resistance from intercurrent infection, or of the injection of foreign blood; and that immunity lasts only as long as the bird remains infected."

A case of rat-bite fever treated successfully by injections of novarsenobillon, G. C. LOW and R. P. COCKIN (*Brit. Med. Jour.*, No. 2981 (1918), pp. 203, 204).—A report of a successfully treated case.

The isolation and serological differentiation of *Bacillus tetani*, W. J. TULLOCH (*Proc. Roy. Soc. [London]*, Ser. B, 90 (1918), No. B 626, pp. 145-158).—The author's observations have led him to consider the following conclusions justifiable:

"More than one variety of (nontoxic) endosporing bacillus, resembling *B. tetani* in morphological characters, can be recovered from wound exudates in cases of tetanus. There are at least three different types of (toxic) *B. tetani*. The 'U. S. A. type' of the bacillus—that commonly used for the preparation of antitoxin—is not frequently obtained from wound exudates in cases of the disease occurring among men who have received prophylactic inoculations of antitetanic serum. Culture in a selective medium, followed by agglutination of the washed growth in presence of the three type sera, gives valuable information. It is, however, apparently not so delicate a test for the presence of *B. tetani* as is animal inoculation after culture of the wound exudate."

A case of tuberculosis in a rat, G. E. BODKIN (*Jour. Hyg. [Cambridge]*, 17 (1918), No. 1, pp. 10-12).—The author reports upon a case occurring in Demerara. A note on the paper by L. Cobbett is appended.

The eradication of tuberculosis from cattle and swine, J. A. KIERNAN (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp.*, 6 (1917), pp. 205-219).—Previously noted from another source (E. S. R., 38, p. 686).

Vesicular stomatitis of horses and cattle, J. R. MOHLER (*U. S. Dept. Agr. Bul.* 662 (1918), pp. 10, pl. 1).—This is a summary of the present status of knowledge of vesicular stomatitis, of which a preliminary account by the author has been previously noted (E. S. R., 38, p. 787).

Investigations indicate that the causative virus is short-lived and is transmitted only by close contact, and that it is very seldom communicated by owners or caretakers of affected animals visiting other farms. As a rule it appears to spread by direct contact with recently affected animals, or by recently infected feed troughs, water troughs, bridles, or pails. Inoculation experiments on such laboratory animals as rabbits, guinea pigs, rats, and mice have resulted negatively. It has been found that the disease manifests itself in susceptible animals more rapidly after the application of infectious material to scarified areas in the mouth than through intravenous injection, although positive results have been obtained also by the latter method.

While comparatively little work has been done on the immunity of this disease, it has been found that immunity persists for at least three months. While the disease has not the great economic importance of foot-and-mouth disease, it is contagious and causes considerable alarm owing to its close resemblance to that affection. Great care should be taken in diagnosing it lest it be mistaken for foot-and-mouth disease. Since it will prove a menace whenever and wherever it may reappear it is strongly urged that local quarantines to prevent its spread be imposed by State live-stock officials in whose territory the disease may be found. While the drooling, vesicles, and erosions are similar in appearance to those produced by foot-and-mouth disease, in none of the animals examined in the field has there been found any soreness of the feet, which is a common symptom of foot-and-mouth disease, and in none of the previous outbreaks in this country have horses been observed to contract foot-and-mouth disease. Hogs, which are not susceptible to vesicular stomatitis, are as susceptible to foot-and-mouth disease as cattle, and the same holds true for sheep. Sucking calves are seldom affected with the disease, and rarely in other than a mild form, while an attack of foot-and-mouth disease in calves is always serious and not infrequently fatal. The vesicles in foot-and-mouth disease as a rule are larger than in vesicular stomatitis, and are more tightly filled with serous fluid. Its differentiation from mycotic stomatitis and from necrotic stomatitis is also pointed out.

Treatment consists in first isolating the affected cases and the administration where possible of 0.5 tablespoonful borax twice daily or the syringing of the mouth several times a day with a 1 per cent solution of permanganate of potassium. Where this is impossible two heaping tablespoonfuls of borax or one tablespoonful of potassium chlorate should be dissolved in a bucket of water and the affected animals allowed to drink or rinse their mouths with this medicated water. Hay should not be fed the first few days, but instead bran or other soft feed should be given.

[Diseases of cattle], W. GILTNER (*Michigan Sta. Rpt.* 1917, pp. 280-282).—In work with hemorrhagic septicemia, which seems to be increasing in importance from year to year, encouraging results were obtained with the complement-fixation diagnosis test, but the agglutination test has given only nega-

tive results. Brief case reports are given on cases of sterility and granular vaginitis.

[Bovine infectious abortion investigations], I. F. HUDDLESON (*Michigan Sta. Rpt. 1917*, pp. 275-280).—This is a summary of investigations on bovine infectious abortion, some of which have been previously noted (*U. S. R.*, 38, p. 284; 39, p. 83).

It was demonstrated that under normal conditions *Bacterium abortus* will not establish itself in the vagina of cows or in the sheath of bulls. A comparative study of different strains of *B. abortus* showed apparently no difference in morphology and staining, or in pathogenic characteristics. Longevity studies of the organism, conducted by inoculating different materials, showed that of 11 strains none could be isolated from wool or silk after two weeks. Two of the strains survived on linen cloth for four weeks. From similar inoculation experiments with sterile soil, sand plus soil solution, hay, and tap water, it was found that the organism could not be isolated from soil after one week, or from sand and soil solution after less than a week. The hay became contaminated, and the experiment was discontinued. The bacteria survived in tap water for 19 days.

To determine the value of different media for isolating and growing *B. abortus* the following combinations were employed: Blood clot agar (blood clot 1 volume, water 2 volumes), ascitic agar (ascitic fluid taken from fetus), amniotic agar (fluid taken from amnion), fetal agar (aborted fetus ground and made up as meat infusion), and glycerin agar and plain agar in different degrees of acidity. The organisms grew well on all media except glycerin agar and plain agar made neutral or 1.5 acid (Fuller's scale) to phenolphthalein. Plain meat infusion agar or blood clot agar made 1.2 acid to phenolphthalein was considered the best medium. It was found impossible to isolate the organism except under anaerobic conditions.

The attenuation of hog cholera virus and its effect on normal hogs, C. L. McARTHUR (*Jour. Infect. Diseases*, 22 (1918), No. 6, pp. 541-553).—This is a report of a series of experiments conducted at the Arkansas Experiment Station on the attenuation of hog cholera virus by different methods and on the effect of this treated virus when injected into healthy hogs which had not been rendered immune to cholera by exposure or vaccine.

The virus was secured from various sources and, in general, had been passed through two generations of hogs. To determine whether the causative organism is intracorpuseular or not, the blood used in the experiments was divided into two portions, so that comparison could be made between the defibrinated blood and the blood corpuscles centrifuged as free as possible from serum. The hogs used were from cholera-free farms and were of various breeds.

The virus was fully virulent until heated, as shown by the length of time (6 to 10 days) required to kill the check pigs. Heating at 55° C. for two hours, at 55° for four hours, at 60° for four hours, and at 65° for two hours attenuated the material to a slight extent, although there was but little difference in effect on normal pigs due to the different temperatures and time of heating. Material heated at 70° for two hours showed considerable evidence of attenuation when injected in quantities of 5 cc. When heated at 70° for four hours in quantities of 0.5 and 0.25 cc. more attenuation was shown than in any of the other experiments, and in only one case was the material virulent enough to produce the disease. In the remaining animals some immunity was produced by the first injection, although all did not withstand an injection of 1 cc. of virulent unheated virus 21 days later. In all cases animals inoculated with heated material finally died in an emaciated condition, in most cases showing typical lesions of chronic hog cholera.

There was but little difference, if any, in the virulence of the virus and of the serum-free corpuscles.

The results indicate that hog cholera virus can be attenuated to a certain extent by heating, but that this heated material is not suitable as a vaccine because in many cases it is apt to cause the disease.

The attenuation of hog cholera virus and its effect upon normal hogs, C. L. MCARTHUR (*Arkansas Sta. Bul.* 139 (1917), pp. 3-28).—This publication includes the report of experiments noted above and additional experiments on the virulence and effect of hog cholera virus when diluted in the blood stream in the normal hog. The virus did not show any indication of attenuation in the blood stream other than would be expected from its dilution by the blood of the animal during the first few hours after the inoculation.

The author also summarizes the methods used and results obtained in studies on complement fixation in hog cholera. The substances prepared as antigens consisted of alcoholic extracts, cholesterinized alcoholic extracts, and extracts in physiological salt solution of different organs of hogs which had been highly infected with cholera. With the different extracts complement fixation tests were conducted on both hog cholera virus and antihog cholera serum, but in no case was an antigen antibody reaction demonstrated.

Some after-effects of vaccination of hogs, W. P. BOSSENBERGER (*Amer. Jour. Vet. Med.*, 13 (1918), No. 4, pp. 174, 175).—The complications briefly referred to are abscess formation, septicemia, and malignant edema.

The streptococcus in acute epidemic respiratory infection of horses.—So-called equine influenza, stable fever, shipping fever, equine typhoid fever, contagious pleuropneumonia, etc., G. MATHERS (*Jour. Infect. Diseases*, 22 (1918), No. 1, pp. 74-79, fig. 1; *abs. in Vet. Rev.*, 2 (1918), No. 2, pp. 163, 164).—A bacteriological study is reported of an epidemic of acute infection resembling equine influenza, or shipping fever, which occurred during the winter of 1915-16 among the horses brought to the Union Stock Yards of Chicago.

"In a bacteriological study of material from 117 horses sick with this disease, hemolytic streptococci were found in predominating numbers in the nasal discharges before death and infected tissues generally after death. Horses inoculated intravenously and intranasally with freshly isolated cultures of these organisms developed clinical and pathologic conditions similar to those observed in horses suffering from the epidemic disease. The presence of pathogenic filtrable virus in material from horses sick with the infection was not demonstrated. Since hemolytic streptococci were so constantly found in predominating numbers in the nasal discharges, blood, and infected tissues of horses sick with this infection, it must be concluded that they are of great importance in the etiology of the disease."

A bibliography is appended.

Researches on equine influenza, R. COMBES (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 19, pp. 898, 899; *abs. in Vet. Rev.*, 2 (1918), No. 2, p. 164).—In a study of 31 horses affected with influenza during an epidemic at Grenoble, France, in 1915, the author found, in addition to streptococci very often present, two bacilli. The one most frequently met with belonged to the paratyphoid group, and the other, which was isolated from only two animals, resembled in many characteristics a Pasteurella but differed from it in possessing the ability to form indol.

Canine coccidiosis, with a note regarding other protozoan parasites from the dog, M. C. HALL and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 1, pp. 64-76, fig. 1).—The authors record the finding of *Diplospora bigemina* in 15 of 200 dogs examined at Detroit.

Studies in abdominal purulent conditions of the hen and some studies in the resistance of the fowl to the pus-producing organisms, B. F. KAUPP (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 3, pp. 381-406, figs. 14).—Some typical cases of purulent peritonitis of the hen are recorded, together with studies in experimental inoculation of birds with the various common pus-producing organisms. The latter studies show that the domestic fowl has great resistance to pus-forming organisms, such as *Staphylococcus pyogenes aureus* and *S. pyogenes albus*. It is only after a prolonged course of injections that changes in the internal organs are produced and local purulent inflammation of the peritoneum results.

Amyloidosis can be produced in the domestic fowl by repeated injections of large doses of staphylococci extending over long periods. The amyloid deposits are found in the liver, spleen, and kidneys. Products of suppuration produce acute parenchymatous nephritis in the hen.

Poultry diseases, B. F. KAUPP (*Chicago: Amer. Vet. Pub. Co.*, 1917, 2. ed., rev. and enl., pp. 245, figs. 80).—A revised and enlarged edition of the work previously noted (E. S. R., 31, p. 88).

RURAL ENGINEERING.

Durability of concrete draitile, II, O. B. WINTER (*Michigan Sta. Spcc. Bul.* 82 (1917), pp. 12).—This is a more complete account of the experimental data previously noted (E. S. R., 35, p. 386), from which the following conclusions are drawn:

"An examination of the disintegrated parts of concrete draitile showed that nearly all of the calcium hydrate, together with a large part of the fine material, had been removed.

"When tile are exposed to the elements in such a way that no solution is forced through their walls, there probably is very little if any disintegration.

"Every solution which was passed through a concrete tile wall had a solvent action on some of the essential constituents of the tile. All of the solutions dissolved considerable lime and most of them dissolved a small amount of the other constituents, as iron, aluminum, magnesium, and sulphur compounds.

"Change of volume also destroyed the tile wall.

"The problem of preparing durable concrete draitile resolves itself into the preparation of a practically impervious tile wall. . . . Of the factors necessary to prepare practically impervious tile, besides good material and good workmanship, the most essential is the proper grading of the aggregate. The reduction of the surface tension of the hydrating water, by regulation of the temperature or the use of some foreign substance, is also important.

"Tile which were graded according to Fuller's maximum density curve were almost impervious, and those graded according to Fuller's maximum density curve and gauged with water and 10 per cent of heavy oil were entirely so."

[Marl handling experiments], H. H. MUSSELMAN (*Michigan Sta. Rpt.* 1917, pp. 342, 343).—In pumping tests with a diaphragm pump, marl more than 50 per cent solid was pumped efficiently from marl beds underlying small marshes. Field tests indicated, however, that some means of agitating and starting the marl must be provided.

Fire protection for grain fields, W. METCALF (*California Sta. Bul.* 295 (1918), pp. 349-368, figs. 10).—Data as to the causes of grain fires in California in 1915, 1916, and 1917 are tabulated, and precautions to minimize losses are discussed. Grain-harvesting machinery is held responsible for 30 per cent of the fires, and means for safeguarding machinery through the use of air clarifiers, spark ar-

resters, fire extinguishers, and other appliances are described. Two homemade spark arresters are described and illustrated.

Tests of the absorption and penetration of coal tar and creosote in longleaf pine, C. H. TEESDALE and J. D. MACLEAN (*U. S. Dept. Agr. Bul. 697 (1918), pp. 42, pls. 11, figs. 14*).—This paper reports the results of an investigation into the effect of tar in creosote upon absorption and penetration of the preservative. The study was made at the Forest Products Laboratory, Madison, Wis.

To eliminate the variability due to species and reduce that due to the character and condition of the wood, the experiments were confined to the wood of one species, longleaf pine. The tests included penetration tests, in which the preservative was applied to a small area in the specimen and measurements made of the penetration secured; and impregnation tests, in which specimens were treated with the preservative under pressure in a cylinder. Experiments were also conducted to determine the effect of varying pressure, time of treatment, and temperature as factors in obtaining absorptions and penetrations from tar and creosote mixtures equivalent to those obtained with creosote. The tests are described in detail and the results are presented in tables and graphs and fully discussed.

Briefly summarized, the addition of coal tar to coal-tar creosote increased materially the difficulty of injection into heart longleaf pine. The resistance to impregnation was increased as the amount of tar was increased, and was greater to coal tars of high than to those of low free-carbon content, even after the free carbon was removed. This indicates that the character of the bitumens as well as the free carbon influenced impregnation. Coal tars produced at relatively low temperatures penetrate better than those produced at relatively high temperatures. Coal tars containing relatively large-sized free-carbon particles favor better penetration of the preservative than those containing small-sized free-carbon particles. In these tests the viscosities of mixtures containing different tars did not appear to have any definite relation to the ease or difficulty of penetration.

In the treatment of paving blocks the most general practice is to inject about 16 lbs. of the preservative per cubic foot of wood. When coal tar was added to coal-tar creosote it was possible to obtain an absorption of 16 lbs. per cubic foot by increasing the pressure, the temperature, and the time of treatment, the amount of the increase required depending upon the kind and amount of tar added. Generally speaking, the tests indicate that the pressure period should be as long as possible, the intensity of pressure being regulated to obtain the desired pressure, while the preservative should be at as high a temperature as it is practicable to work without injuring the wood. From 190 to 220° F. may be satisfactorily used in treating longleaf-pine paving blocks. Better treatments may be obtained in wood which has narrow annual rings.

RURAL ECONOMICS.

A farm management study in southeastern Minnesota, A. BOSS, A. H. BENTON, and W. L. CAVERT (*Minnesota Sta. Bul. 172 (1917), pp. 3-51, figs. 15*).—The area included in this survey consists of four townships in the eastern part of Rice County, Minn. The records were obtained in 1912-13. The farms average 135 acres in size and \$14,401 in value. The labor income was \$319, and of the 400 farms surveyed, 25.3 per cent made minus labor incomes, 35.7 per cent made incomes varying from \$100 to \$400, 32.8 per cent made labor incomes from \$400 to \$1,000, and 6.2 per cent, incomes of more than \$1,000. The men averaged 249 days of productive labor per year, and horses, 81. The average cost of man and horse labor was \$11.94 per crop acre. On the average one man

cared for 53.9 acres of crops and 11 units of productive live stock; a horse cared for 20.9 acres of crops.

On farms where less than 30 per cent of the receipts were for cash crops, higher labor incomes were made than on farms where the larger proportion came from this source. Farmers with less than six acres of farm for each unit of productive live stock showed higher average labor incomes than those with more than six acres for each unit. The five factors found to be important in obtaining satisfactory labor incomes were size of farm, crop yield per acre, returns per unit of productive live stock, number of days of labor annually accomplished per man, and number of days of productive labor annually accomplished per horse.

Status of farming in the lower Rio Grande irrigated district of Texas. R. E. WILLARD (*U. S. Dept. Agr. Bul. 665 (1918), pp. 24, figs. 10*).—The area surveyed is located in the southern portion of Cameron and Hidalgo Counties, Tex., and the findings relate to conditions during 1915.

It is pointed out that good land can be secured at prices ranging from \$15 to \$250 per acre or may be rented for from \$3 to \$10 per acre. It also appears that farms of less than 40 acres are not so successful as those of a larger size. In general, staple crop and stock farms are larger in acreage than truck farms, although the last named type, being more intense, does a larger business, acre for acre, than do farms of other types. When 50 per cent of the crop land is utilized for a second crop, the net returns are greater than when a smaller acreage is double cropped. The most successful farms are those which produce a considerable diversity of truck crops during the winter months, practically the whole farm being in staple crops during the summer. The growing of truck and feed crops, with hogs as a side line, makes one of the most satisfactory types of organization from the standpoint of stability and profits.

A farm management study of cotton farms of Ellis County, Tex. R. E. WILLARD (*U. S. Dept. Agr. Bul. 659 (1918), pp. 54, figs. 19*).—The data on which this bulletin is based are obtained from a survey of the business of 120 farms in 1914.

Among the findings set forth by the author are that every operator with less than \$4,000 was a tenant, while everyone with more than this was an owner. Also in spite of the fact that tenants with an average capital of only \$1,200 made nearly as much as owners with \$10,000, tenants with \$2,500 invested made distinctly greater incomes than owners with an investment four times as great. He points out the following facts with reference to the size of farms:

"There is better utilization of capital on the large farms than on the small ones. Each dollar of working capital (stock, equipment, etc.) accomplishes more work on the large than on the small farms. The management is more economical, although possibly not quite so efficient, on the large farms than on the farms of less acreage. The most efficient size for two-horse farms here appears to be from 55 to 60 acres of crops; for four-horse farms from 95 to 105 acres, and for six-horse farms from 140 to 155 acres.

"There is a slightly greater percentage return on the large farms than on the small ones, due to better utilization of labor and lower unit cost of operation. The total net receipts are greater on the large farms than on the small ones. The small farms show a greater yield of cotton per acre than the large farms.

"Farmers of this region have not generally made the mistake of operating too small an area for the efficient utilization of capital and labor; the smallest farm studied consists of 39 acres of crop land, and the largest, 522 acres."

The author also notes that there are a few farms in the county which may be classified as dairy or diversified farms. The average number of productive

live stock found per farm was equivalent to 4.26 mature animals, which usually consisted of a cow or two for the production of milk and butter, a few hogs for meat, and a moderate-sized flock of poultry for eggs and meat.

He also gives data as to the cost and value of lint and cotton seed. He estimates that the cost of producing a pound of lint was 8.3 cents, and the cost of seed per ton, \$12.34. The value of the lint per pound was 11.2 cts., and the seed per ton, \$16.03.

Farm making in upper Wisconsin. B. G. PACKER and E. J. DELWICHE (*Wisconsin Sta. Bul. 290 (1918), pp. 71, figs. 42*).—This pamphlet is issued by the Wisconsin Department of Agriculture, in cooperation with the station, to supply information to settlers in this State. Information is given as to how land may be selected according to soil fertility, how it may be managed during the pioneer stage, and how to secure further information with respect to the soil, crops, and market facilities.

AGRICULTURAL EDUCATION.

Rural-teacher preparation in county training schools and high schools. H. W. FOGHT (*U. S. Bur. Ed. Bul. 31 (1917), pp. 71*).—Part 1 of this bulletin presents the present status of teacher training in secondary schools now carried on in 21 States. This includes the Wisconsin county training schools, which are considered the only genuine county training schools in every respect separate from the public high schools; schools with teacher preparation in separate departments, called county training schools or classes, which use public-school buildings and equipment for their work, as in New York, Michigan, Minnesota, Nevada, and Ohio; and teacher preparation as a part of the regular high-school work, as in Arkansas, Florida, Iowa, Kansas, Maine, Maryland, Missouri, Nebraska, North Carolina, North Dakota, Oklahoma, Oregon, Vermont, Virginia, West Virginia, and Wisconsin. Reference is made to instruction in agriculture and home economics in some of these schools. Part 2 gives the views of educators on teacher-training schools in their own States, and part 3 contains a summary of teacher-training courses in secondary schools, with suggestions for their improvement.

Elementary agriculture in public schools (*Ann. Rpt. Dept. Agr. Prince Edward Island, 1917, pp. 51-70, pls. 4*).—This report includes a discussion of rural science as a regular subject in the school curriculum of Prince Edward Island, a schedule of grants for the teaching of rural science, rural science in Prince of Wales College, consisting of regular class work and assistance to teachers, home project work in the schools of the Province for 1917, and the organization of rural-school fairs and extent of the movement.

Home and school gardening in Detroit. Mrs. M. H. GROSVENOR (*Ann. Rpt. Hort. Soc. Ontario, 12 (1917), pp. 105-107, fig. 1*).—This is a report on the organization and work of the garden department in Detroit.

Children's gardening in Detroit is conducted by the city as one of the activities of its recreation commission. The policy of the department is home gardening, but one large community garden was maintained which provided several hundred children with small plats. The department also conducted demonstration gardens at two of the public schools and cooperated with other organizations in six community gardens and a patriotic garden bureau and garden school for the benefit of garden teachers and the public who desired information on modern scientific gardening.

Gardening and canning clubs were organized and an advisory council and local leader sought among the people of the community or teachers of the school

to which the club belonged. The kitchens of a number of public schools, settlements, and private homes were opened to the recreation commission for canning centers, and canning meetings were held regularly once a week and many times oftener. Exhibits of fresh and canned products were held and prizes awarded. Annual garden festivals were held in the public schools in September.

Garden clubs in the schools of Englewood, N. J., C. O. SMITH (*U. S. Bur. Ed. Bul. 26 (1917), pp. 44, figs. 39*).—This is an account of the organization, methods of instruction, and garden and publicity work of the garden clubs in the schools of Englewood, N. J., which were organized in the summer of 1916 and were directed by the local board of education and the superintendent of schools through a supervisor of gardens employed for this special purpose. The club members were taken in club groups on excursions to various well-managed farms, nurseries, etc. A boy's narrative of a trip to a farm, follow-up plans, blanks and circulars used, and a copy of a garden notebook are included.

Methods of teaching types and breeds and poultry judging, QUAST (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 4 (1918), No. 7, pp. 53-56*).—The author discusses the teaching of (1) types and breeds of poultry in the following order, viz, a history of breeds and varieties, a study of types, and a study of color, and (2) judging. Suggestions are offered for conducting a student poultry show to complete the work.

Mounted charts on display frame for teaching breeds of poultry in the classroom (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 4 (1918), No. 7, pp. 50-52, 53, pl. 1, figs. 9*).—Directions are given for the construction of a display frame mounted with bromides and feathers for class study in teaching breeds of poultry.

MISCELLANEOUS.

Thirtieth Annual Report of Colorado Station 1917 (*Colorado Sta. Rpt. 1917, pp. 32*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, a report of the director on the work of the station, and departmental reports.

Annual Report of Idaho Station, 1917 (*Idaho Sta. Bul. 104 (1918), pp. 51*).—This contains the organization list, reports by the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the Federal funds for the fiscal year ended June 30, 1917, for local station funds from July 1 to December 31, 1917, and for the substations for the fiscal year ended December 31, 1917.

Thirtieth Annual Report of Michigan Station, 1917 (*Michigan Sta. Rpt. 1917, pp. 261-678, figs. 39*).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue; a financial statement for the fiscal year ended June 30, 1917; and reprints of Bulletins 276-278, Special Bulletins 80 and 81, Technical Bulletins 28-32, and Circulars 31 and 32, all of which have been previously noted.

Twenty-fifth Annual Report of Minnesota Station, 1917 (*Minnesota Sta. Rpt. 1917, pp. 89*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1917, and for the State funds for the fiscal year ended July 31, 1917, and reports of the director, heads of divisions, and the various substations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Fortieth Annual Report of North Carolina Station, 1917 (*North Carolina Sta. Rpt. 1917, pp. 335, pl. 1, figs. 127*).—This contains the organization list, a

report of the director and heads of departments, a financial statement for the fiscal year ended June 30, 1917, a special article noted on page 356, and reprints of Bulletin 237 and Technical Bulletins 11, 12, and 13, all of which have been previously noted. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of South Dakota Station, 1917 (*South Dakota Sta. Rpt. 1917, pp. 38*).—This contains a report by the director on the organization, work, and publications of the station, a financial statement for the fiscal year ended June 30, 1917, and departmental reports, of which portions of that of the horticulturist are abstracted on page 346 of this issue.

Annual Report of Virginia Station, 1917 (*Virginia Sta. Rpt. 1917, pp. 39, figs. 7*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1917. The experimental work reported is for the most part abstracted elsewhere in this issue.

Barn and field experiments in 1917, C. D. Woods (*Maine Sta. Bul. 269 (1918), pp. 44, figs. 3*).—These experiments are presented in 10 articles abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), Nos. 2, pp. 17-27; 3, pp. 29-44, figs. 3*).—These numbers contain brief articles on the following subjects:

No. 2.—Marketing Information, by A. Hobson; Growing Cabbage, Cauliflower, and Broccoli, by J. L. Stahl (see p. 345); Kale, Marrow Cabbage, and Dwarf Essex Rape, by E. B. Stookey (see p. 338); The Forced Roost, by G. R. Shoup; and Mites, Lice, and Fleas, by Mrs. G. R. Shoup.

No. 3.—Seeding New Land, by H. L. Blanchard; Saving the Hay Crop, by W. A. Linklater; Concerning Hog Raising, by W. A. Linklater; Control of Garden Diseases and Insects, by A. Frank; and Intestinal Worms Affecting Poultry, by Mr. and Mrs. G. R. Shoup.

NOTES.

Arkansas University and Station.—J. W. Read has been appointed to succeed J. B. Rather as head of the department of agricultural chemistry.

Connecticut State and Storrs Stations.—C. B. Morison, assistant chemist at the State Station, has been given leave of absence to enter military service. Since the destruction of the chemical laboratory at Storrs, the chemical work of that station has been done at the State Station, and H. D. Edmond, chemist of the Storrs Station, is now employed jointly by the two stations in the laboratory at New Haven.

Maryland Station.—A new agricultural seed law, conforming closely to the uniform bill approved by the Association of Official Seed Analysts of North America, becomes effective October 1.

Dr. R. L. Hill has resigned as biochemist to accept a commission in the Army, and Dr. Paul Emerson as soil bacteriologist to become associate bacteriologist in the Idaho Station.

Minnesota University and Station.—Dr. C. H. Eckles, of the Missouri University and Station, has been appointed chief of the dairy husbandry division. J. C. Cort has been appointed assistant dairy husbandman of the station.

T. G. Paterson, associate professor of animal husbandry, and R. C. Ashby, assistant professor, have resigned, the former to engage in commercial work and the latter to become field secretary of the National Poland-China Association. W. H. Peters, animal husbandman of the North Dakota Station, has been appointed professor of animal husbandry beginning October 1. P. A. Anderson has been made assistant professor in charge of the section of meats.

I. D. Charlton has resigned as professor and chief of the division of farm engineering. Wm. Boss has been appointed acting chief of the division for the period of the war. J. L. Mowry has resigned as assistant professor of farm engineering, effective October 15. H. B. White has been made assistant professor of farm buildings.

H. S. Records has been appointed assistant professor of agronomy and agronomist at the Crookston substation. Other appointments include E. Maud Patchin as assistant professor of textiles and clothing and Margaret K. Mumford as instructor in foods and cookery. In order to replace men called to military service, assistants have been appointed as follows: Irene Ahern in agricultural biochemistry; Emily H. Payne, Ida R. Saul, and Anna Wentz in entomology; Grace Keller and Georgia Durkin in soils; and Dyllene R. Hempstead in horticulture.

W. W. Cumberland, chief of the division of agricultural economics, has been given leave of absence for service with the War Trade Board.

Nevada Station.—M. R. Miller, assistant chemist in the insecticide and fungicide control work of the California Station, has been appointed chemist, effective September 1.

North Dakota Station.—H. O. Werner has resigned as horticulturist to accept a position as State potato specialist at the University of Nebraska.

Oklahoma College and Station.—Walter Stemmons, college and station editor, resigned October 10 to accept a position with the Connecticut College.

Rhode Island Station.—George E. Merkle, assistant in chemistry, has resigned.

Utah College and Station.—A plant industry building is being erected to house eventually the departments of botany, horticulture, and agronomy. During the period of the war the building will be used for barracks for the Students' Army Training Corps.

Willard Gardner, Ph. D., has been appointed assistant physicist and meteorologist.

Virginia College and Station.—S. C. Harman, instructor in agronomy and assistant agronomist, resigned October 1 to take charge of agricultural work in the high school at Driver, Va., and has been succeeded by F. S. Glassett.

Washington College and Station.—Howard Hackedorn, extension assistant professor of animal husbandry in the University of Missouri, has been appointed professor of animal husbandry and animal husbandman of the station, assuming his duties early in October.

Wyoming University and Station.—K. T. Steik, associate professor of chemistry and engineering chemist, has been granted a year's leave of absence for graduate study at the University of Chicago. P. T. Miller has been appointed head of the department of chemistry and associate research chemist.

Clark V. Singleton has been appointed assistant in animal husbandry, and Miss May Kinney assistant in the wool investigations.

Association of Official Agricultural Chemists.—Announcement is made that owing to the housing congestion and Spanish influenza epidemic in Washington, D. C., and other reasons, no meeting of the association will be held this year. A meeting of the executive committee has been called to consider current matters and make arrangements for the coming year.

Necrology.—David Ernest Lantz, specialist in the destruction of noxious rodents in the Bureau of Biological Survey of the U. S. Department of Agriculture since 1904, died in Washington, D. C., during the recent epidemic of Spanish influenza. Professor Lantz was for many years professor of mathematics in the Kansas State Agricultural College, as well as librarian. He was the author of numerous bulletins dealing with the destruction of prairie dogs, gophers, rats, etc.

William H. Bishop, professor of agriculture in the National Farm School of Doylestown, Pa., since 1903, died July 1, aged 59 years. He was a graduate of the Massachusetts Agricultural College in 1882 and was for 12 years professor of agriculture at the Delaware College. He had also been superintendent of agriculture at Tongaloo University, Miss., and horticulturist at the Maryland Experiment Station.

Conservation of Paper by Farm Journals.—Under regulations of the War Industries Board, effective October 1, a 15 per cent reduction in the consumption of print paper must be made by agricultural periodicals during the coming year. Among the means to be adopted to effect this saving are the discontinuing of free copies except for service rendered. Some exceptions are made to this requirement, however, among them being Government departmental libraries which use these publications in their work, agricultural institutions, experiment stations, and employees of National and State departments of agriculture who use the publications for public service.

EXPERIMENT STATION RECORD.

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The intimate relation of our agricultural institutions to reconstruction measures affecting agriculture lends a special interest to the steps which are being taken by other countries in this direction. This interest increases as the war progresses and it becomes more evident how far-reaching and radical its effects are upon all our industries. It is seen with respect to agriculture that many of these influences and changes will be of a permanent character, while the effects of others will be felt in modified form. All need to be taken account of to the permanent interest of the industry.

The readjustment of agriculture to the changed conditions and changed point of view will afford an unusual opportunity for strengthening its position and bringing about improvements in country life long advocated if proper guidance is exerted. There will be many problems to be worked out and many conflicting interests to be met, which will call for a strength and courage supported by clear vision and exact knowledge of the facts. This gives enlarged opportunity and new obligations to our agricultural institutions, which must be largely relied upon for wise leadership and stimulation in working out and promoting quite definite policies. It should give them a position of unusual influence.

A notable example of timely preparation for agricultural reconstruction is furnished by Great Britain, where the position taken is of particular interest because it involves some of the most radical suggestions regarding agriculture which have been put forward anywhere, representing a revolution in the attitude toward food production and the use of land.

Matters relating to reconstruction have commanded attention in that country for some time, reflecting the conviction that the problems and adjustments must be anticipated as far as possible and the answers or proper courses of action determined before instead of after the close of the war. At the outset this matter was in the hands of a cabinet committee, but later more definite provision was made by the appointment of a special committee headed by the Prime Minister, which was commissioned "to anticipate the urgent

difficulties of the future and to provide in advance as far as possible for the ready adjustment of the machinery of government to the new tasks which will need to be put in hand without delay on the conclusion of the war."

Both of these committees were active and work was started under various subcommittees, but in July, 1917, the Government decided that a stage had been reached which required a Ministry of Reconstruction, and this was established to continue during and for a period of two years or less after the war. A special agency was thus constituted which was made responsible for the investigation of the whole field of probable readjustment and reconstruction after the war. It was to provide for research—not in the field of the physical sciences but into questions of political science—and it constituted an official agency to which suggestions might be submitted, insuring a broad and thorough consideration of measures proposed by governmental or private agencies before they are presented for legislation. The object was thus to build up in consultation with the other departments of the Government a thoroughly considered policy of reconstruction in all its branches for submission to the cabinet.

Certain committees previously appointed were continued, some of which have since reported, and for purposes of administration the new department was divided into branches, with one on rural development. An advisory council was also provided to assist in considering the many and varied proposals which come before the department, one section of which deals with agriculture; and to insure breadth of view in this council each of the various sections has represented in its membership all of the principal interests embraced in the council as a whole.

Under the head of rural development the ministry is working, among other things, on land settlement in association with the Board of Agriculture, and the material is being brought together for a review of the land question as a whole. Studies have been made of the working of the Small Holdings Act of 1908, and of proposals for war allotments of land, and a committee on land acquisition has reported. On the basis of a committee report on forestry a scheme has been prepared for the consideration of the Government; and a plan for the organization of county officers for advice and information on agriculture has advanced sufficiently far to be brought to the attention of the advisory council for discussion.

Special interest attaches to a comprehensive report on the subject of agricultural policy, recently completed and published by the Ministry of Reconstruction. This report is the work of a subcommittee on the subject, appointed in August, 1916, to consider and report

upon the methods of effecting an increase in the home grown food supplies, having regard to the need of such increase in the interests of national security.

Early in the war Mr. T. H. Middleton, assistant secretary of the Board of Agriculture and Fisheries, prepared a most interesting and instructive pamphlet on *The Recent Development of German Agriculture*. In this, it will be remembered, he reviewed the history and position of British agriculture in comparison with that of Germany, and called sharp attention to the difference in the policy pursued by the two countries toward that industry, with their effects. This frank report attracted quite widespread attention, and some of its conclusions as to the effects of persistent neglect of British agriculture were emphasized as the war progressed. In a measure it prepared the way and served as a background for the work of the committee on agricultural policy.

This committee undertook a comprehensive inquiry into the prevailing condition of agriculture, the causes and influences which had been operative over a long term of years, and a frank statement of the results. The necessity for the Government taking steps to promote increased food production led to the submission of certain of its findings and recommendations in an interim report nearly two years ago. This strongly emphasized the need for a new agricultural policy, and recommended that as a war measure the State should fix minimum wages for agricultural labor, guarantee minimum prices for wheat and oats, and authorize steps to secure the proper and efficient use of land for agricultural production. A synopsis of this first part of the report has been made in these pages (*E. S. R.*, 38, p. 402), and it is interesting to note here that the "corn production law" passed by the Government embodied these chief recommendations of the report.

The full report of this committee has now appeared, including the second part which records the studies made on other phases of the question. Its scope is broader than that of the first part, and it embodies along with its recommendations an interesting survey of agricultural institutions, organizations, existing practices with reference to land tenancy, agricultural holdings, taxation, etc. It thus supplies a large amount of general information in condensed form not readily available elsewhere.

For the promotion and administration of agricultural affairs in the United Kingdom there are three departments of agriculture. The first in order of establishment is the Board of Agriculture for Great Britain, which was originally charged merely with the administration of certain acts of Parliament. Then came the Irish Department of Agriculture, founded about 1895 with the definite

idea of promoting a constructive agricultural policy; and finally in 1911 Scotland severed its agricultural administration from that of England and Wales under a separate board of agriculture. These three departments are conducted and administered independently of one another, leaving no single agency responsible for the agriculture of the whole realm.

The committee recognizes that it would have been better for agriculture if there had been only a single department for the Kingdom, and reflects the view that the dispersion of agriculture between three offices has undoubtedly lessened the influence of the agricultural interest in the cabinet, and contributed to the lack of public concern for this most vitally important national industry. It does not, however, recommend a union at this time, but proposes steps by which the three departments be brought into conference on agricultural matters affecting the whole United Kingdom, and strongly urges that the board for England and Wales be materially enlarged and strengthened.

The later board was originally created by royal charter in 1793, lapsed with the discontinuance of Parliamentary grant in 1822, and was revived nearly thirty years ago. It was charged with the administration of certain acts and the collection of statistics and had no responsibility for the development of the industry. With the change of public opinion it gradually expanded its activities in aid of agriculture, but the committee expresses the view that it is not yet wholly adequate, and that it should become "a great department of state charged with the care of agriculture in its widest sense and with the promotion of the welfare of rural as distinct from urban life. Its duties should be to assist and stimulate agriculture by every possible means as a basic national industry, to promote the production of food in England and Wales, and to regard the increased prosperity and happiness of the rural population as its special care. It should also encourage and cooperate with voluntary organizations which exist for the promotion of these objects."

It is recommended that the department be brought together in an adequate building, that its staff be increased and strengthened, and that the status of the administrative officer in charge be raised to that of the presidents of other important boards. At present the department has assigned to it the subject of fisheries, which from its importance the committee suggests might well be turned over to a separate ministry.

The war agricultural committees which have been set up in England and Wales under the county councils it is advised should be replaced by statutory committees working under the Board of Agriculture. The formation of national agricultural councils for

England, Scotland, and Wales, are outlined, in addition to the existing agricultural council in Ireland, and it is suggested that representatives from these councils meet for conference at stated intervals with a view to encouraging more harmonious action.

Considerable space is devoted to the subject of agricultural education and research, and it is urged that farmers should have placed at their disposal "the best available scientific and practical advice." So much importance is attached to this matter and to the material development of existing facilities for agricultural education, technical advice, and research that it is made a necessary condition of success in effecting the proposed changes in the industry. The subject, it is thought, should be under the control of the Board of Agriculture in England and Wales, instead of the county councils as at present, and the system supported from the public treasury.

"Agricultural education must be pressed forward in every county as a fundamental part of a national agricultural policy; the nation can no longer afford to incur the risks of local and short sighted inaction; it must, therefore, give full powers to the president of the Board of Agriculture and put the responsibility on his shoulders. It follows, therefore, that the public exchequer and not the local rates must bear the financial burden." An improved ruralized curriculum for elementary and secondary schools is also advocated.

The report expresses appreciative commendation of the research work which is being done in agriculture, and recommends that it be extended and given stronger support from public funds. It urges that "this is productive expenditure which will bring in to the State manifold return. . . . The evidence that has been laid before us has amply shown the ultimate value of pure scientific research and the dependence of the development of the industry upon investigation that is independent of any apparently important practical end."

One line along which more adequate data is urged is in relation to the cost of production of staple agricultural products. The disturbed condition produced by the war has emphasized this necessity and has reflected clearly the absence of fundamental economic data connected with the industry. The Institute for Research in Agricultural Economics at Oxford represents a beginning in this direction, but it has been at work for too short a time and on too small a scale to be able to supply what has proved to be so desirable to the proper understanding of the industry and its part in the national life.

Another great need cited is the establishment of an institute for research in agricultural machinery. Such an institute would have, it is thought, a stimulating effect upon the development of machinery

to meet the rapidly changing conditions of agriculture, and upon the men responsible for the designing of agricultural implements. It would also insure better instruction in farm machinery at the agricultural colleges where the subject has been very inadequately dealt with in the past. Itinerant advisors on mechanical questions should, it is thought, be a part of the equipment of county instruction.

Apart from research, attention is called to the necessity of providing local experiments on a commercial scale throughout the country upon the possibility of cultivating crops not at present grown, and the development of various rural industries closely linked with agriculture. The promotion of sugar-beet growing was dealt with in the first part of the report, and it is believed that provisions should be made for experiments with various other agricultural crops. Specific recommendations are also made with reference to schemes for the improvement of live stock, under the Board of Agriculture. Plans are also suggested for demonstration and illustration farms, and for the establishment of a limited number of larger demonstration farms run on business lines. Other suggestions are made for enlarging and strengthening the scheme for local aid and advice to farmers.

The belief is expressed that women may play a great part in the reconstruction of agriculture after the war and that their intellectual interest in country life must be aroused if an increased rural population is to develop. "The fact is that local conditions which have brought about rural depopulation, bad housing, low wages, lack of prospects, affect women even more than men, and that the influence of women might have been exerted in the opposite direction if they had been taught to make more comfortable homes with less drudgery, and if they had the necessary knowledge to enable them to build up the social order in which the natural advantages of the country life could be made to counterbalance the artificial attractions of the town." The war emergency has led a considerable number of women to undertake farm work, and it is urged that their continuance in the country should be stimulated and given every possible encouragement, along with better opportunities for their education and assistance.

The importance of agricultural organization and cooperation is emphasized, and additional support from national funds is favored for existing agricultural organization societies. It is not felt that the cooperative movement can become established within any reasonable measure of time without State assistance, and it is the definite opinion that it can be better developed on a voluntary basis than as an institution of Government. Agricultural credit also comes in for quite lengthy consideration, and recommendations are made for

cheapening and simplifying the procedure in respect to loans, for the provision of short term credits through cooperative trading societies and farmers' central trading boards, and for making available for this purpose the deposits in the postal savings banks.

As would be expected, questions relating to land and its use in agriculture occupy a prominent place in this report and in the framing of a national agricultural policy. The systems of land ownership and tenancy in the United Kingdom have long been subjects of discussion as to their ultimate effect upon the agricultural industry and the rural question, from which have resulted the many measures for providing small holdings and for making possible the acquisition of land by small farmers. The questions involved are too complicated to be entered into in detail here and have only an incidental interest in this country.

The committee declines to express any general opinion as to the comparative productivity of large farms and small holdings, but is outspoken in its belief that both forms of holdings are essential if the most is to be made out of the land and of country life. It holds that the national life will be strengthened by a greater diversity of tenure and types of holding, that a large increase of small holdings is necessary, and that the latter is the surest means of increasing rural population, which is so greatly desired. This matter is also discussed with reference to providing holdings for demobilized soldiers and sailors, for which a considerable demand is anticipated.

A strong plea is made for village reconstruction, in order to improve social conditions and make life there less stagnant. Illustrations are cited of what has been done in that direction through enterprising leadership, and it is maintained that "no agricultural policy will be worth having which does not aim at a better developed social life in our villages, at the introduction of fresh industries into the country districts, and at a large increase in the rural population."

Considerable prominence is given to a variety of questions turning on the relations of landlord and tenant as to occupancy of land, compensation of tenant for unexhausted improvements, for damage by game, for dispossession by reason of sale, etc., and for compensation of landlords for deterioration of holdings, as well as questions relating to the use of the land by tenants for fruit growing and market gardening. These matters are largely governed by existing law and custom, and in light of the evidence secured recommendations are made applying to many of them.

The possible extension of agricultural areas by reclamation, drainage, and other means was naturally included in such an inquiry. An instructive memorandum by Sir Daniel Hall, former director of

Rothamsted, is submitted which shows that the area brought under cultivation in England increased year by year up to 1892, but ceased with the great fall in agricultural prices, as reclamation did not repay costs. Opportunities for reclamation on a reasonably large scale are furnished by marsh and tide lands, low lying moor and bog, sand blown land adjoining the sea, large expanses of sandy heath, and upland sheep pasture.

While no large expectations are held out in this direction the experience of other countries is cited, and it is concluded that "no quantitative program of land reclamation can be formulated until an agency has been constituted to take up and investigate the merits of each proposition that presents itself." The establishment of reclamation and land drainage authorities for each of the three kingdoms is recommended, and attention is directed to the necessity of legislation and of inquiry into the principles on which land should be acquired by the State for reclamation.

It is estimated that in Scotland there are some 3,600,000 acres of land devoted exclusively to deer forests and sport, quite a portion of which might be used for agricultural purposes. A special survey is advised to determine the areas suited to sheep farming and other agricultural purposes.

Among other matters to which attention is given are provisions for the control and eradication of pests of various kinds, plant diseases and weeds, the adequate supply of fertilizers, weights and measures, and facilities for the transportation of agricultural products and supplies.

The extraordinary diversity of weights and measures employed in the sale and purchase of agricultural products is pointed to as a minor but no less real disadvantage, peculiar to British agriculture. Three systems of weights and measures have legal authority in the United Kingdom, but apart from these, local or customary measures are found in almost every county or district, with the result that there are something like twenty-five local measures or weights used in the sale of wheat alone, while twelve different bushels, seven gallons, thirteen pounds, ten stones, three hundredweights, and nine different tons are in existence. As the report says, the result is confusion, misunderstanding, and ground for minor litigation, which are detrimental to the industry and place the producer at an obvious disadvantage in dealing with those more experienced in market operations. The matter is recommended for the consideration of a special subcommittee; and the same position is taken with reference to adequate transportation.

In the conclusion of its report the committee reverts again to the recommendations made in its interim report and enacted in the

emergency measure known as The Corn Production Act. It strongly urges the necessity after the war of enacting in a permanent statute the principles embodied in the act, providing a guaranty of the price of wheat and oats to secure stability of conditions to all who live upon the land, a minimum wage to insure to the agricultural laborer his fair share of the profits of agriculture, and a power in reserve to the State to influence the use of land to the greatest national advantage. It is maintained that unless this is done "there can be no hope of the people of the United Kingdom becoming emancipated from dependence on supplies of foodstuffs brought from overseas, or of the increase of our rural population."

The illuminating feature of this report is not alone the changes which are deemed essential for the reconstruction of British agriculture, but the illustration it gives of what is necessarily involved in defining and developing a definite agricultural policy for such a country. The framing of a program involving such radical change and development reflects the new attitude and sentiment in Great Britain which have come out of the war.

Special emphasis is laid upon the fact that the recommendations made by the committee have not been asked for by land owners or farmers, but have been made exclusively in the national interest and not in that of any individuals or class of individuals.

Criticisms of the principles involved in the interim report have been severe on some points, reflecting especially a conflict of interest between the plans proposed and those of individuals for developments in other directions. These criticisms reach to the very heart of the wisdom of encouraging agriculture in Great Britain, some of them wholly ignoring the value to the nation of a mixed rural and urban population, and in effect denying any place to agriculture in the national life. This position is strongly controverted by the committee, which expresses its mature conviction of the importance to the country of providing a stable and resourceful agricultural industry competent to meet the needs of the country in a considerable measure. Not only is this maintained as good economic policy, but the advantage of an increased rural population with opportunity for development and with a fuller sense of social unity is emphasized as an essential asset in national welfare.

British agriculture has been the subject of numerous royal commissions and committees since the depression set in some forty years ago. The difficulty which its supporters on these occasions have experienced has been to secure any general acceptance of the principle that a prosperous agriculture was so essential to the national life as to justify the changes implied. But the necessities of the war have

brought about a changed relation between the State and agriculture which was recognized in the Corn Production Act, and other far-reaching reforms are necessary if this relation is to be maintained and the greatest production from the land insured.

It will be noted that many of the provisions and viewpoints urged in this program have been under consideration in this country, and some have been put into effect by enactment of suitable legislation. This is true of most of the steps advocated for agricultural education and instruction, local aid to farmers, rural credit, etc. But there remain to be solved many broad questions relating to the industry and the conditions surrounding it in this country, as well as the people living by it. These economic and sociological questions will be more insistent in the future and will deserve a large measure of study.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Edible oils and fats, C. A. MITCHELL (*London: Longmans, Green & Co., 1918, pp. XII+159, pls. 4, figs. 4*).—This volume is one of the series of monographs on industrial chemistry edited by E. Thorpe. It includes a concise outline of the chemical composition and properties of the more important oils and fats, together with a description of the methods of extracting them from the crude materials, and of purifying and preparing them for food purposes. The physical and chemical methods of examining edible oils are described and tables of typical constants are given. The manufacture of hydrogenated oils and of margarin is described in detail. An extensive bibliography is appended.

The chemistry of linseed oil, J. N. FRIEND (*London: Gurney & Jackson, 1917, pp. VII+96, figs. 2; rev. in Analyst, 43 (1918), No. 506, p. 186*).—This volume is one of a series of chemical monographs edited by A. C. Cumming. It contains an introductory section on the classification of oils and waxes, and sections on the manufacture, chief constituents, and properties and reactions of linseed oil, on the chemistry of linseed oil and linoxyn, and on polymerized and oxidized oils. An extensive bibliography is appended.

Attempts at biological saponification of different fatty substances of the French colonies (*Bul. Off. Colon. [France], 11 (1918), No. 124, pp. 227-234*).—A study is reported of the hydrolyzing action of the lipase of the castor bean on various little-known fats and oils of the French colonies. Certain oils were found to contain in themselves a saponifying ferment.

Chemistry of the cotton plant, with special reference to Upland cotton, A. VIEHOEVER, L. H. CHERNOFF, and C. O. JOHNS (*Jour. Agr. Research [U. S.], 13 (1918), No. 7, pp. 345-352*).—This paper, which is the first of a series of papers from the Bureau of Chemistry of the U. S. Department of Agriculture on the chemistry of the cotton plant, describes the isolation of the glucosids and their products from Upland cotton (*Gossypium hirsutum*), and reports preliminary studies of an ethereal oil which has been isolated from different parts of the cotton plant.

The leaves and flowers with petals removed were found to contain quercimeritrin, while the petals contain both quercimeritrin and isoquercitrin. No traces have been found of gossypitrin and gossypetin, which have been isolated from other types of cotton. An ethereal oil was isolated from *G. hirsutum*, which is different from that found in the bark of the root of *G. herbaceum*. It distills mainly between 200 and 300° C., and leaves a black empyreumatic residue. The lower fractions of the distillate have a yellow to greenish-yellow color, the higher fractions light blue-green to dark blue. This oil proved to be attractive to the boll weevil.

A chemical examination of the loganberry, M. R. DAUGHTERS (*Oregon Sta. Bul. 151 (1918), pp. 10*).—This publication includes the history and economic importance of the loganberry and analytical data on its chemical composition. Some of the analytical data have been previously noted from another source

(E. S. R., 39, p. 9). The constants of the oil extracted from the finely ground dried pulp by means of petroleum ether (boiling point, 44 to 65° C.) are as follows: Sp. gr. 0.926, refractive index 1.4811, solidifying temperature -33°, iodine number 158.32, and saponification number 179.8.

As judged by these constants, it is considered that the oil will make a good substitute for linseed oil as a drying oil.

A bibliography of 39 titles is appended.

Loganberry juice, C. I. LEWIS (*Oreg. Countryman*, 10 (1918), No. 9, pp. 369, 370).—A brief description is given of the methods of procedure in the commercial manufacture of loganberry juice.

By-products of the fermentation of cabbage, V. E. NELSON and A. J. BECK (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 6, pp. 1001-1005).—Commercial fermented cabbage was examined for its content of acids, alcohols, and esters as follows:

Five hundred gm. of the canned cabbage was made slightly acid with sulphuric acid and distilled with steam until 2 liters was collected. The volatile acids in the distillate were titrated with $\frac{N}{10}$ barium hydroxid, with phenolphthalein as an indicator, and the alcohols and esters were distilled from the barium salts until 50 cc. was obtained. This solution was then saponified with 10 cc. of 20 per cent potassium hydroxid, and the alcohols distilled off, concentrated to 50 cc., and oxidized on the water bath with a solution of potassium dichromate in sulphuric acid. The acids resulting from the oxidation of the alcohols were distilled and converted into barium salts. The potassium salts of the acids formed in the saponification were then decomposed with dilute sulphuric acid, distilled, and the distillate titrated with $\frac{N}{10}$ barium hydroxid. Both sets of acids were then subjected to the Duclaux method for analysis and estimation.

The results of seven analyses showed that the volatile acids represented a considerable proportion of the total acidity and consisted of acetic and propionic acids only, except in two cases in which formic acid was isolated. Lactic acid in the inactive form was the only fixed acid obtained. Alcohols were found to the same extent as volatile acids and consisted entirely of ethyl and propyl alcohols. The esters were found in small amounts, but evidently contributed largely to the odor and flavor of the product. Mannitol was found to the extent of from 2 to 2.5 per cent.

The pungent principles of ginger.—I, Zingiberone. (A correction.) H. NOMURA (*Sci. Rpts. Tôhoku Imp. Univ.*, ser. 1, 6 (1918), No. 5, p. 375).—The author proposes to substitute the name "zingerone" for zingiberone, previously noted (E. S. R., 37, p. 612), as the ketone bears no relation to the sesquiterpene alcohol to which the name zingiberone has been given.

A study of the antiseptic properties of certain organic compounds, I. J. KLIGLER (*Jour. Expt. Med.*, 27 (1918), No. 4, pp. 463-478).—For the purpose of studying the structural chemical factors involved in the action of dyes on bacteria a series of representative organic compounds, mostly of the aromatic series, was selected, and their action on a number of typical bacteria was studied quantitatively under carefully controlled conditions. The results are expressed in tabular form, the compounds being arranged in the order of their increasing antiseptic power. The following tentative conclusions are drawn:

The higher the concentration of organic nitrogenous compounds in the medium the lower is the effective concentration of the dye. The reaction of the medium modifies the specific action of the antiseptic. The antiseptic power is apparently increased by an increase in the number of alkyl radicals, is increased

to a greater extent by an ethyl than by a methyl group, and is increased by the introduction of a methyl group in the nucleus. The simple anilin derivatives, as well as the dyes, are more toxic for the Gram-positive than for the Gram-negative organisms. The most marked specific selective effect is manifested by the triphenylmethane dyes.

Improved methods for the estimation of sodium and potassium, S. N. RHUE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 429-431).—The author, at the Ohio Experiment Station, has devised improvements in the modification of the official method for the estimation of sodium as described by Forbes, Beegle, and Mensching (E. S. R., 29, p. 807). The general principles of the method are the same, but changes of detail have been devised which shorten the process and involve the use of much less platinum. In the ashing of the substance the principle of the second optional method (in which the little sulphuric acid used is entirely driven off) has been followed, and porcelain dishes are used instead of platinum. After the precipitation of the phosphorus in the solution of the ash as magnesium ammonium phosphate, the ammonium salts are destroyed by digestion with nitric and hydrochloric acids, these acids being finally driven off, first by evaporation and then by baking on the hot plate.

The official Lindo-Gladding procedure for the estimation of potassium has been similarly modified as to ashing and digesting the ash. The modified methods for both sodium and potassium are described in detail.

The testing of sodium bisulphite in the laboratory of the A. V. R. O. S., F. C. VAN HEURN (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 1, pp. 12-21; *Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser.*, No. 6 (1918), pp. 12-21).—The author states that technical samples of sodium bisulphite generally contain, in addition to the bisulphite itself, some sodium sulphite and sodium sulphate ($\text{Na}_2\text{SO}_3 + \text{NaHSO}_3 + \text{Na}_2\text{SO}_4$). The second component is most valuable, while the third is quite worthless. In dissolving the sample for analysis the sodium bisulphite becomes sodium sulphite plus sulphurous acid ($\text{Na}_2\text{SO}_3 + \text{H}_2\text{SO}_3$). Taking this into consideration, the following method of analysis has been developed:

About 1 gm. of the material is weighed in a weighing tube, a small quantity of water added, and the solution poured into a graduated glass-stoppered volumetric flask and made up to 1 liter. This solution is used for all determinations.

To determine the amount of sulphur dioxide (SO_2) present as real bisulphite, 100 cc. of the solution is placed in an Erlenmeyer flask and titrated with $\frac{N}{10}$ potassium hydroxid, using phenolphthalein as an indicator. Double the quantity of SO_2 found is present as bisulphite. This amount multiplied by $1.63 \left(\frac{\text{NaHSO}_3}{\text{SO}_2} = 1.63 \right)$ gives the maximum amount of sodium bisulphite that can be present.

To determine the total amount of SO_2 , some of the original solution is placed in a burette and titrated with 25 cc. of $\frac{N}{10}$ iodine. The amount of SO_2 present as normal sulphite is then found by subtracting from the total SO_2 the amount present as bisulphite. To determine the amount of sulphate 100 cc. of the solution is placed in an Erlenmeyer flask, and 1 cc. of concentrated hydrochloric acid and a few drops of alcohol are added. The air in the flask is replaced by carbon dioxide, and the solution is heated and precipitated with a 10 per cent solution of barium chlorid.

Hydrogen ion concentrations of various indicator end-points in dilute sodium hypochlorite solutions, G. E. CULLEN and J. H. AUSTIN (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 553-568, fig. 1).—A study is reported of the end-points of the indicators, powdered phenolphthalein, an alcoholic solution of phenolphthalein, and an alcoholic solution of *o*-cresolphthalein in dilute sodium hypochlorite solution with a view to the preparation of Dakin's solution.

It was found that the end-points to the various indicators in the order mentioned in a 0.5 per cent sodium hypochlorite solution were at a p_H of 10.1, 8.5 to 8.8, and 9.3. The first gave a solution of too high and the second of too low alkalinity for clinical use. From a study of the carbonate concentration employed in the titration with the third indicator, which gave an end-point at a satisfactory hydrogen ion concentration, it has been found that Dakin's solution having the required p_H of about 9.4 can be readily prepared by passing chlorine gas through a sodium carbonate solution of an initial concentration of 14 gm. to the liter until sodium hypochlorite is formed in a concentration of 0.5 per cent as shown by titration with thiosulphate. A solution thus prepared has proved very satisfactory for clinical purposes.

Fractionating apparatus for petroleum oils and other products, E. HILDT (*Ann. Falsif.*, 11 (1918), No. 111-112, pp. 39-43, fig. 1; *Ann. Chim. Analyt.*, 23 (1918), No. 6, pp. 117-120, fig. 1; *Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 23, pp. 790-793, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 11, p. 1137).—An apparatus is described in which the fractionation is effected by heating the liquid in six flasks in which are sealed condensing tubes connected at the bottom with siphon tubes passing through the flasks. In the flasks are placed, as heating agents, liquids whose boiling points correspond to the initial and maximum boiling points of the desired fractions, the first flask containing the liquid with the highest boiling point. The uncondensed vapors pass into the succeeding tube and the condensed liquid is drawn off by means of a siphon tube.

A diagram is given of the apparatus.

A study of the glucosazone reaction, I. D. GARARD and H. C. SHERMAN (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 6, pp. 955-969, figs. 2).—The investigations reported were undertaken to determine definitely the conditions affecting the glucosazone reaction and the effect of some substances other than glucose, and to improve the method for the detection of glucose when present in very small amount with a large amount of some other carbohydrate. The effects of the concentration of the reagent, acidity of the reaction, concentration of sugar in the mixture, and duration of the reaction were studied. The following conclusions were drawn:

"The correct melting point of phenylglucosazone is 208° C. regardless of the method of purification. There is a concentration of phenylhydrazine which produces a maximum yield of glucosazone; any increase in the concentration above this results in a rapidly decreasing yield, probably due to the increased solubility of the osazone in the reagent. The efficiency of the reagent depends upon the acidity and is independent of the negative ion of the acid used. The range of acidity in which the reaction takes place is rather slight, between $p_H + 4$ and 6. The maximum lies close to 4.7 and is best secured with acetic acid and sodium acetate. Very slight change in acidity takes place during the reaction. Within fairly wide limits a variation of the size of the sugar sample used has very little effect on the percentage yield of osazone beyond the effect due to the constant loss which results from the solubility of the osazone. . . . While maltose and dextrin retard the formation of the precipitate, lactose retards it to a greater extent and starch has very little effect."

The authors state that a knowledge of the various factors above recorded makes it possible to interpret the results of an osazone reaction in a wider

variety of cases than has been possible heretofore. As an illustration analytical data are given on a typical problem.

The application of optical methods of identification to alkaloids and other organic compounds, E. T. WHERRY (*U. S. Dept. Agr. Bul. 679 (1918), pp. 9*).—This publication describes the apparatus and methods employed for the determination of optical constants of crystalline alkaloids. The instrument used is the petrographic microscope with which observations are made in ordinary light, parallel polarized light, and convergent polarized light. Samples for examination are prepared by gently crushing the dry substance, immersing a small amount of it in a drop of a liquid in which it is insoluble on a glass slide, and protecting it by a small cover glass. If the sample is a drug mixture the alkaloid contents may be extracted with chloroform, dried, taken up in benzene, and allowed to stand until the solvent is nearly evaporated. Single large drops of the concentrate are placed on several microscopic slides and immediately protected by cover glasses. When the benzene is completely volatilized, the immersion liquids are introduced and the observations made.

The method is said to be successful in establishing the identity of crystalline alkaloids, even when mixed in widely different proportions.

Bacteriological examination of canned foods, A. W. and K. G. BITTING (*Nat. Canners Assoc. Bul. 14 (1917), pp. 45, pls. 2, figs. 20*).—The authors state that the bacteriological examination of canned foods usually has for its object one of three things: First, to determine whether foods which appear normal are sterile; second, to determine whether foods which appear to be defective are sterile, and if not sterile whether the spoilage is due to underprocessing or to leaks; and, third, to determine from the finished product the character of the original material. In this bulletin the subject is discussed from these points, and detailed directions are given for the examination of the canned goods and the interpretation of results.

A brief outline of literature on the counting of organisms is appended.

Cocoas treated with alkali in distinction from natural cocoas, ROCQUES and TOUPLAIN (*Ann. Falsif., 11 (1918), No. 111-112, pp. 19-26; abs. in Analyst, 43 (1918), No. 507, pp. 217, 218*).—Analyses of cocoas according to the method previously noted (E. S. R., 37, p. 414) are reported. The authors emphasize the necessity of not only establishing a maximum quantity of alkaline carbonates to be allowed, but of prescribing that the cocoa thus treated should preserve an acid reaction.

The water content of true final cane molasses, H. C. P. GEERLIGS (*Internat. Sugar Jour., 20 (1918), No. 233, pp. 214-218; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 13, p. 335 A; Chem. Abs., 12 (1918), No. 16, p. 1709*).—The author states that the exhaustion of molasses is best and fluidity greatest at a refractive figure for the dry substance of 84°, corresponding to a water content of 16 per cent. Assuming the figure for refraction of the molasses to be that of the dry substance and the quotient of purity to be the relation between sucrose and dry substance, the amount of sucrose present in the mother liquor and also in the mother liquor after it has been diluted to 84 per cent of dry substance can be calculated.

A table is given of a number of analyses of such molasses.

Determination of acidity in condensed milk, M. DUGARDIN (*Ann. Chim. Analyst., 23 (1918), No. 4, pp. 83, 84; abs. in Chem. Abs., 12 (1918), No. 15, p. 1569*).—The acidity is determined by diluting 10 gm. of the condensed milk with 25 cc. of distilled water from which the carbon dioxid has been removed by boiling. The liquid is then titrated with $\frac{N}{10}$ sodium hydroxid with phenol-

phthalein as an indicator and the result calculated as percentage of lactic acid.

Examination of pure samples and samples manifestly altered led to the conclusion that condensed milk can be considered unaltered if the acidity expressed as lactic acid per 100 gm. of material is below 0.5 gm., as altered those samples whose acidity lies between 0.5 and 0.75 gm., and as entirely unfit for consumption all milk whose acidity exceeds 0.75 gm.

Detection of added color in butter or oleomargarin, H. A. LUBS (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 436-439, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 16, pp. 1670, 1671).—The author discusses some of the qualitative tests in use for the detection of added colors in fats and suggests certain modifications in the methods employed. The methods for separating azo colors from fats, described by Mathewson (*E. S. R.*, 36, p. 714), are criticized, and a new method of procedure for the separation from fats and the identification of yellow A B and yellow O B is described in detail.

Determination of the purity of castor oil, CHERCHEFFSKY (*Ann. Chim. Analyt.*, 23 (1918), No. 4, pp. 75-81, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 14, p. 1518; *Analyst*, 43 (1918), No. 507, pp. 218, 219).—The author criticizes the methods of Frabot, previously noted (*E. S. R.*, 39, pp. 109, 110), for determining the purity of castor oil by difference in solubility in appropriate solvents on the ground that the results obtained are uncertain, due to the differences in age and acidity of the oil examined and to differences in composition of the petroleum ether used as a solvent. As a substitute method a determination of the critical temperature of solution is recommended. This is the temperature at which the solution of a fat in an appropriate solvent becomes turbid on recooling when the temperature is higher than the boiling point of the solvent. The method is as follows:

Into a glass tube about 9 or 10 cm. long and 6 or 8 mm. in diameter a few drops of the oil to be examined are introduced, together with an equal number of drops of the selected solvent. The tube is then fastened to the bulb of the thermometer, which is gently heated in a bath of sulphuric acid or glycerin. When the liquid in the tube has become homogeneous the bath is allowed to cool and the temperature at which turbidity is produced represents the critical temperature of solution. This constant is fixed for each fatty substance and is a function of the solvent employed.

With 85 per cent ethyl alcohol as a solvent, castor oil of the first pressing gave a reading of 66° C. and oil of the second pressing 67°. Tables are given of the effect on this reading of various percentages of other oils. The presence of two parts per 100 of a foreign oil in castor oil increases the critical temperature by from 3 to 5°.

The method is considered by the author to be the simplest and most accurate for the determination of the purity of castor oil.

Determination of the purity of castor oil, C. FRABOT (*Ann. Chim. Analyt.*, 23 (1918), No. 6, pp. 120-125).—This is a refutation of the criticism of Chercheffsky, noted above, in regard to the determination of the purity of castor oil by means of solubility in petroleum ether.

Moisture content of plantation rubber in Java, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 1, pp. 45-54).—This paper contains a preliminary review of moisture determinations in samples of plantation rubber as received for testing at the Central Rubber Station during the months of October to December, 1917. In 54 samples of first latex crepe from 18 estates the moisture content varied from 0.34 to 1.01 per cent, the average being 0.67 per cent. Up to 1 per cent must be considered as a normal moisture content for the season. Moisture determinations on 96 samples of smoked sheet from 25 estates

ranged from 0.43 to 1.16 per cent, the average being 0.76 per cent. Data are also given for samples of smoked sheet prepared with different anticoagulants (formalin, sodium sulphite, and soda), indicating a variation in moisture content with differences in the method of preparation. In samples of lower grade a moisture content of 1.5 per cent was seldom exceeded.

The oil content, keeping qualities, and commercial possibilities of Para rubber seed, F. G. SPRING and F. W. F. DAY (*Agr. Bul. Fed. Malay States*, 6 (1918), No. 5, pp. 231-244).—This article includes a summary of information, previously noted (E. S. R., 31, p. 766), concerning the utilization of Para rubber seeds for technical purposes and as a feeding stuff and an account of recent investigations conducted by the Department of Agriculture of the Federated Malay States on the oil content of the seeds under varying conditions. The oil was extracted from crushed seeds with petroleum ether in a Soxhlet apparatus. Tables are given showing the percentage of oil in the seed and in the dried meal, the moisture, and the acidity calculated in milligrams of potassium hydroxid per gram of fat.

The experimental results show that any slight decomposition that may take place when the sun-dried seed is stored has little effect on the quantity or quality of the oil. The sun-dried seed with husks (moisture content 8.6 per cent) contains about 27 per cent of oil, equivalent to 29.5 per cent on the sun-dried meal. The husked seed (moisture content 6.4 per cent) contains 47.5 per cent of oil equivalent to 51 per cent on the dried meal. The average percentage of protein in the dried kernels is 15.3, representing 27.3 per cent on the residual cake after 45 per cent of oil has been expressed from the kernels.

The authors point out the commercial possibilities of the oil in that it requires little refining, is obtained from a waste product available in large quantities, and is easy to collect, transport, store, and crush. In view of restricted freight facilities, shipping the oil instead of the seed is suggested as more practical.

The balance of some of the principal constituents of the sugar beet during the manufacture of sugar, E. SAILLARD (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 17, pp. 697-699; *Vie Agr. et Rurale*, 8 (1918), No. 30, pp. 67, 68).—The averages of numerous analyses of the sugar beet and of various by-products obtained in the manufacture of sugar have been compiled from statistics from 20 sugar factories throughout a period of 15 years, and are as follows:

Composition of products obtained from the sugar beet in the manufacture of sugar.

Kind of product.	Dry matter.	Nitrogen.	Potassium.	Sodium.	Phosphoric acid.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Diffusion pulp and juice.....	5.6	0.084	0.08	0.014	0.018
Carbonation cake.....	1.2	.035			.080
Molasses.....	3.0	.084	.20	.033	
White sugar.....	12.4				
As ammonia in condensation water.....		.037			
Loss.....	.1				
Total.....	22.3	.220	.28	.047	.098

The author points out that the nitrogen from the diffusion pulp and carbonation cake can be returned to the soil, while the nitrogen which is separated as ammonia during the heating of the alkaline juices and sirup is lost in the water of condensation. This loss represents about 17 per cent of the total

nitrogen of the sugar beet, and combined with the nitrogen lost in the burning of the bagasse amounts to 50 per cent of the nitrogen. At the present price of nitrogen this loss is considered as deserving attention.

Maple sirup and sugar production, B. A. CHANDLER ([*Albany*]: N. Y. State Food Com. [1918], pp. 7).—This leaflet gives directions for sugar production on a small scale and with a standard equipment. Suggestions are given for marketing the products, and a list of the more important articles of a complete sugar-making equipment with average prices is appended.

Can, dry, and store for victory (*Canada Food Controller Pamphlet 2* [1918], pp. 16, figs. 4).—This pamphlet gives general directions for the home canning, drying, and storing of vegetables and fruits.

Chemical French, M. L. DOLT, (*Easton, Pa.*: Chem. Pub. Co., 1918, pp. VIII+398).—This book is intended for students of chemistry wishing to acquire a reading knowledge of chemical French. Part 1 consists of a review of the essentials of the language, followed by elementary exercises in inorganic, analytical, organic, physical, and industrial chemistry. Part 2 consists of selections for advanced reading, including articles published in the French journals of chemistry by some of the best-known French chemists.

METEOROLOGY.

The effect of weather on the yield of corn (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 12* [1918], p. 3).—It is stated that "a rather exhaustive study of the effect of weather on the yield of corn has shown that the critical period in the growth of this cereal, during which favorable weather will cause a large crop and unfavorable weather a small yield, is comparatively brief. These studies have shown that the controlling weather factor varying the yield in the great corn producing areas of the United States is rainfall; and also that July is the most important calendar month, but that the period from about the middle of July to the middle of August has a far greater effect on the production of corn than any other period of similar length. The rainfall for the 10 days following the blossoming stage has an almost dominating effect upon the yield of corn, the yield varying directly with the amount of rainfall, provided the latter is not excessive. High temperature and dry weather during the 10 days after blossoming have a very unfavorable effect upon the yield."

On the effect of vegetation on the rainfall of South Africa, H. PEALING (*So. African Jour. Sci., 14* [1917], No. 3, pp. 142-145).—In this article the author attempts to show that the amount of the inland summer rainfall is dependent to a large extent upon the character and quantity of the vegetation of the country intervening between the inland area and the coast from which the rain winds come. He "rejects the rain gauge as an instrument for determining whether the amount of rainfall in South Africa has been undergoing an alteration—as the character of the rainfall has undoubtedly altered over large tracts of the country—a large portion of the rainfall being torrential downpours where formerly gentle soaking rains were the rule."

Rainfall of the United States, C. F. BROOKS (*Science, n. ser., 48* [1918], No. 1229, pp. 69-72).—This is a discussion of the original and seasonal distribution and intensity of rainfall in the United States, based upon rainfall maps prepared by the Weather Bureau for publication in an atlas of American agriculture.

Meteorological summaries (*Kentucky Sta. Rpts. 1916, pt. 1, pp. 99-101; 1917, pt. 1, pp. 91-93*).—Tables give the monthly and annual mean temperature and precipitation at Lexington, Ky., from 1872 to 1916 and 1917, inclusive,

respectively, as well as more detailed summaries of meteorological observations at the same place for 1916 and 1917.

Annual report of the Iowa Weather and Crop Service for 1917, G. M. CHAPPELL (*Iowa Weather and Crop Serv. Ann. Rpt. 1917, pp. 67, figs. 2*).—This report includes summaries of the monthly and weekly bulletins issued by the Iowa Weather and Crop Service in cooperation with the Weather Bureau of the U. S. Department of Agriculture.

The climate of Anne Arundel County [Maryland], O. L. FASSIG (*Md. Geol. Survey [Rpt.]*, 8 (1917), pp. 175–192, pl. 1, figs. 4).—The available records of temperature and precipitation of this county for the greater part of the past 85 years are summarized in tables, and the climatic history of the past 20 years is presented in greater detail. The average annual temperature is about 56° F. The isotherm of 56° bends sharply toward the north through the county as a result of the influence of Chesapeake Bay. The frostless period averages fully 200 days, from the middle of April to the close of October. The average annual rainfall is about 45 in., and the distribution is very uniform.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, A. L. CHANDLER, and G. A. SMITH (*Massachusetts Sta. Met. Buls. 353–354* (1918), pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1918, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological, magnetic, and seismic observations of the College of Belen, Habana, 1917, L. GANGOTTI (*Observatorio Meteorologico, Magnetico y Seismico del Colegio de Belen de la Compañia de Jesus en la Habana, año de 1917, Habana, 1918, pp. 99*).—Detailed daily and monthly summaries are given, and the characteristic features of each month are described in notes.

SOILS—FERTILIZERS.

Physiological balance in the soil solution, R. P. HIBBARD (*Michigan Sta. Tech. Bul. 40* (1918), pp. 5–44, figs. 8).—In an effort to obtain information concerning deficiencies in certain nutrients occurring in the soil and the consequent addition that should be made to procure the proper balance investigations were undertaken in which young wheat seedlings were used as physiological indicators. Soil solutions were secured from a very sandy soil low in fertility and from a fertile sandy loam soil by the Morgan oil-pressure method, previously noted (E. S. R., 39, p. 20). The soil extracts were then treated with a complete nutrient solution suggested by Shive (E. S. R., 36, p. 328), containing magnesium sulphate, calcium nitrate, and monopotassium phosphate in all possible combinations of 10 per cent increments. The experimental work embraced three sets of 36 cultures each. Initial osmotic concentrations ranged from 1.94 atmospheres for the set representing the infertile soil to 3.56 for that representing the fertile soil. The third set of cultures, having a concentration of 1.94 atmospheres, was prepared by diluting the soil solution obtained from the fertile soil. All the cultures were compared on the basis of the dry weight of wheat seedlings produced (both tops and roots), upon transpiration and water requirement, and upon the range of ionic ratio values of Mg/Ca, Mg/K, and Ca/K and the relative dry weight of tops and roots. A method is described for obtaining a large supply of vigorous seedlings, together with a device for keeping the plants upright and separate during growth. The first set of experiments was conducted out of doors, while the other two were con-

ducted in the greenhouse. All the data are presented in tabular form and fully discussed. The principal results may be summarized as follows:

Of the two soil solutions extracted, that from the fertile soil was capable of supporting a more luxuriant growth than that from the infertile soil. This was not regarded as being entirely due to a higher osmotic concentration, however, for when reduced to the same initial osmotic concentration as that of the other solution there was still a better growth. The explanation is thought to lie more in the fact that the solution was richer in certain kinds of solutes, being an extract from more fertile soil and thus confirming the observations of Schreiner and Skinner that the crop-producing power of various soils is transmitted to their aqueous extracts.

At an initial osmotic concentration of 1.94 atmospheres there was better growth where the ratio approached the optimum, while the growth declined at other ratios. The total osmotic concentration suffered a greater decrease, as shown by conductivity and cryoscopic measurements, at the better or around the optimum salt ratio than at other ratios. The optimum ratio of the three salts in the solutions in the set representing the infertile soil where the initial osmotic concentration was 1.94 atmospheres was 7:1:2, seven-tenths of the total concentration being derived from KH_2PO_4 , one-tenth from $\text{Ca}(\text{NO}_3)_2$, and two-tenths from MgSO_4 . The optimum ratio obtained when distilled water was used instead of soil solution was 5:2:3, indicating that the soil probably lacked potassium and phosphoric acid. Treating the soil with the dry salt (KH_2PO_4) at the rate of 150 and 300 lbs. per acre, the increase of dry weight of the entire wheat plant for a period of at least three weeks in the first case was 24 per cent and in the second 48 per cent.

The optimum ratio of the three salts in the solutions in the set representing the fertile soil, where the initial osmotic concentration was 3.56 atmospheres, was 2:7:1 as compared with a ratio of 5:2:3 obtained in the distilled water series, indicating that the soil solution was improved by the addition of the calcium salt. It is pointed out that some of the excellent growth may probably be due to the presence of the nitrate radical. How much may be attributed to either was not determined, but it was apparent that the soil needed lime. Treating this soil with the dry salt of $\text{Ca}(\text{NO}_3)_2$ at the rates of 200 and 400 lbs. per acre increased the dry weight of the entire plant for a period including the first three weeks by 26 and 38 per cent, respectively.

High transpiration was found to be correlated with high yields of both tops and roots, and low transpiration with low yields of both tops and roots. While the water requirement for roots and tops combined appeared to be less per unit of dry matter in the culture, it did not follow that when grown with the best salt ratio the plant, as a whole, required less water for growth. There was, in fact, a greater actual water requirement, since in such cultures the plants were larger and more thrifty.

Formation of layers in suspensions of soils and clays. Their explanation and their application in the investigation of soils for agricultural purposes, P. EHRENBERG, E. HAHN, and O. NOLTE (*Kolloid Ztschr.*, 21 (1917), pp. 1-19; *abs. in Jour. Chem. Soc. [London]*, 112 (1917), No. 660, 11, p. 453; *Chem. Abs.*, 12 (1918), No. 6, p. 598).—"The literature relating to the formation of layers in suspensions is reviewed, and an account is given of new experiments which have been made with suspensions of ultramarine. Measurements of the concentration of the suspended substance and of the number of the particles in the more or less sharply differentiated layers indicate that the stratification is due to the circumstance that the size of the particles varies in such a way that the particles fall into discontinuous groups. In each of these groups the particles approximate in size to the mean value which is characteristic of the

group; this is, moreover, appreciably different from the mean size of the particles belonging to the neighboring groups."

Changes in the nitrogen content of stored soils, W. A. ALBRECHT (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 2, pp. 83-88; *abs. in Chem. Abs.*, 12 (1918), No. 7, p. 735).—Samples of silt loam and clay loam soil, with varying nitrogen and water contents, were stored in a laboratory where ammonia was used, in a room near the laboratory, in a basement room, and in a greenhouse, and the total nitrogen, ammonia, and nitric nitrogen were determined at the beginning of the experiment and at different intervals of time thereafter.

It was found that there was little or no change in the nitric nitrogen, but that there was a slight increase in total nitrogen, especially in the samples stored in and near the laboratory. This was due apparently to adsorption of ammonia, there being little indication that bacteria had any measurable effect on the nitrogen content.

[Report of soil investigations in Florida], S. E. COLLISON (*Florida Sta. Rpt.* 1917, pp. 97-102).—Samples of soils collected in 1914 and 1915 from fertilized plats in a citrus grove were analyzed for total and acid-soluble phosphorus, and the results are reported in tabular form. The samples were collected near the trees where the fertilizers were applied and from the middle of the rows where no fertilizer had been used. In general a considerable increase in the phosphoric acid content was observed, amounting to from 43 to 52 per cent for plats receiving four times the standard application of phosphoric acid and over 20 per cent for those plats receiving the standard amount. Determinations of the acid-soluble phosphoric acid were deemed rather inconclusive.

The results of analyses of the drainage water from eight soil tanks are also noted.

Indiana soils containing an excess of soluble salts, S. D. CONNER (*Proc. Ind. Acad. Sci.*, 1916, pp. 403, 404).—Analyses of samples of mixed soil in which onions failed to grow showed from 0.44 to 0.5 per cent nitrates and from 1.12 to 1.2 per cent soluble salts, as compared with from 0.1 to 0.17 per cent nitrates and from 0.45 to 0.57 per cent soluble salts on portions of the field where the onions grew well. Analysis of water extracts of such salts indicated that the soluble salt was largely calcium nitrate, although this was not believed to be the sole cause of crop injury. Excess soluble salts in clay or loam soils are said to have been found only where refuse matter had been dumped or where old stables had stood. Soil samples taken at various depths on the site of an old stable where crops were reported to have failed for five years showed 0.1 per cent nitrates, 0.85 per cent water-soluble potash, and 2.54 per cent total soluble matter in the surface 6 in., while at a depth of from 24 to 30 in. there was 0.012 per cent nitrates, 0.44 per cent water-soluble potash, and 1.33 per cent total soluble salts.

Rational treatment for Kentucky soils, G. ROBERTS (*Bien. Rpt. Bur. Agr., Labor, and Statis.* [Ky.], 22 (1916-17), pp. 401-408, pls. 2, map 1).—The author briefly reviews soil-fertility investigations conducted on experiment farms located at Lexington, London, Berea, Greenville, Russellville, Lone Oak, and Mayfield, respectively, representing certain of the soil areas of the State as previously described (E. S. R., 34, p. 121) and dealing especially with the use of limestone and phosphates. On all fields except that at Lexington, limestone and acid phosphate showed a net gain per rotation (corn, soy beans or cowpeas, wheat, and clover) of \$26.78 per acre, as compared with an increase of only \$4.81 for acid phosphate alone. "Without question, the most important requisite for increasing fertility of the soils outside of the blue-grass region is the use of limestone and phosphates. However, they should be regarded only as

a basis for improvement, for the restoration of nitrogen and organic matter is absolutely essential to the maintenance of high productiveness."

[Report of soil fertility work in Kentucky], G. ROBERTS (*Kentucky Sta. Rpt. 1917, pt. 1, pp. 10-17*).—This report is embodied in the article noted above.

Soil survey of Mitchell County, Iowa, W. E. THARP and K. ESEE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 298,880 acres situated in the northeastern part of the State and bordering the State of Minnesota. The uplands, constituting 77.4 per cent of the total area of the county, have an undulating to very gently rolling surface. Narrow valleys and small areas of terrace soil occur along the principal streams.

The soils of the county are derived from glacial or glacial-loessial material of the Iowan drift underlain at a considerable depth with thick beds of limestone. Fourteen soil types representing 11 series are mapped in addition to meadow and muck. Carrington silt loam predominates, occupying 74.4 per cent of the total area.

Soil survey of Ringgold County, Iowa, E. C. HALL, W. E. THARP, and F. B. HOWE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 29, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 345,600 acres situated in the southwestern part of the State and bordering the State of Missouri. Physiographically the county is a plain incompletely dissected by erosion, the uplands having an undulating and gently rolling to rolling surface. Natural drainage is well established.

Ringgold County lies within the glacial and loessial province, and the soils are prevailingly silt loam in texture. The soils are derived mainly from two layers of material overlying the country rock. The top layer is considered to be loessial and is composed of fine-textured silty material. The Kansas drift, consisting of a mixture of rock, gravel, sand, silt, and clay, immediately underlies the silty loam. Nine soil types of seven series are mapped. Shelby loam, Grundy silt loam, and Wabash silt loam predominate, occupying 49.3, 33.2, and 14.4 per cent of the total area, respectively.

Soil survey of Newton County, Miss., A. L. GOODMAN and E. M. JONES (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 43, fig. 1 map 1*).—This survey, made in cooperation with the Mississippi Geological Survey, deals with the soils of an area of 370,560 acres situated in the east-central part of the State and lying wholly within the Coastal Plain province. Natural drainage is generally well established. The topography of the county varies from a level or gently undulating prairie to gently rolling, hilly, ridgy, and rough, sandy uplands which comprise much the greater part of the county.

The soils of the region are derived from sedimentary formations of heavy clay, sandy clay, limestone, and the white siliceous rock belonging to the Tallahatta buhrstone formation. The soils of the second-bottoms, terraces, and overflow bottoms are of alluvial origin, consisting of material washed down from the uplands. Twenty-five soil types of 16 series are mapped. Ruston fine sandy loam, Ruston very fine sandy loam, and Orangeburg fine sandy loam predominate, occupying 16.3, 13.6, and 11.1 per cent of the total area, respectively.

Soil survey of Richland County, S. C., C. VAN DUYNE, W. E. McLENDON, and T. D. RICE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 72, figs. 2, map 1*).—This survey deals with the soils of an area of 476,800 acres lying near the geographical center of the State. The northern two-thirds of the county is described as a fairly high rolling to hilly dissected plateau or plain,

while the southern third is a level to undulating plain. Topographically the area is divided into five sections, the Piedmont region, the Sandhill region, the Red Hill region, the level Coastal Plain belt, and the river-bottom and terrace division.

Three well-defined soil provinces are represented conforming closely to the main topographic divisions indicated above and include the Piedmont plateau with residual soils, the Coastal Plain with old sedimentary soils, and the River Flood Plains with recent-alluvial and terrace soils. Exclusive of steep, broken land, 29 soil types of 16 series are mapped. Norfolk sand occupying 20.9 per cent of the total area, Congaree silty clay loam occupying 12 per cent, and Norfolk sandy loam occupying 10.6 per cent are the main types.

Concerning the tea soils of Java and Sumatra, J. J. B. DEUSS (*Verzamel. Verhandel. Grond Nederland. Indië Gebruik Landb., Bodemecong. Djokjokarta, 1916, No. 18, pp. 7*).—This is a brief general discussion of the physical and chemical nature of the tea soils of Java, Sumatra, and Ceylon, based largely upon a compilation of work of other investigators. These soils are said to be usually of volcanic origin, although in certain regions they are derived from sedimentary formations which are much older and much more weathered. These latter are also said to be less porous than the volcanic soils and more clayey.

The tea soils of Java and Sumatra, J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 55 (1917), pp. 28, pls. 4, figs. 2*).—The author discusses the physical properties of certain tea soils of Java and Sumatra, supplementing a previous paper noted above. The work and methods of Mohr (E. S. R., 24, p. 316) with regard to mechanical analyses of the soils of Java, the observations of Atterberg (E. S. R., 21, p. 106; 32, p. 617) relative to clay analysis and correlated physical properties of soils such as plasticity, hygroscopicity, capillarity, etc., and the work of other investigators are reviewed in some detail. Tabulated data on numerous mechanical soil analyses are presented and fully discussed.

Observations by Lawes and Gilbert, Whitney, and Schreiner and Lathrop relative to the so-called "toxins" of the soil are also briefly noted.

[The Dutch East Indies soil congress] (*Verzamel. Verhandel. Grond Nederland. Indië Gebruik Landb., Bodemecong. Djokjokarta, 1916, Nos. 1, pp. 14, pl. 1; 4, pp. 3; 5, pp. 3; 7, pp. 5, figs. 2; 10, pp. 2; 11, pp. 7; 12, pp. 16, figs. 4; 17, pp. 19, pls. 3*).—The following is a collection of papers presented at the soil congress held in Djokjokarta, Java, October, 1916: Tobacco Soils in the Crown Lands, by O. de Vries (No. 1); Cultural Methods in Cassava Growing in the Region of Bandoeng, by S. C. Visscher (No. 4); Cultivating and Manuring European Tobacco Near Besoeeki, by A. J. Ultée (No. 5); Cultural Methods with Tobacco Near Deli (No. 7); Tobacco Soils of Besoeeki, by A. J. Ultée (No. 10); "Ladang" Culture (dry land rice culture) and Its Influence upon Maximum Production, by A. J. Koens (No. 11); General Review of the Soils of the East Indies and Some of Their Properties, by E. C. J. Mohr (No. 12); and Green Manuring, by C. Bernard (No. 17).

Rate of humification of green manure, R. H. CARR (*Proc. Ind. Acad. Sci., 1916, pp. 398-402*).—The author presents data on humus determinations and vegetation tests with corn, obtained in investigations already noted (E. S. R., 37, p. 718), from which he draws the following conclusions relative to the rate of humification of cowpeas, alfalfa, sweet clover, and oats used as green manures:

Oats practically doubled the humus content of the soil, followed by sweet clover, cowpeas, and alfalfa in the order named, alfalfa failing to show any appreciable increase. All crops showed rapid humification, there being slight

increase after two months. Rolling under the green manures proved to be better for corn than disking in or drying. The highest corn yield was obtained after oats, with alfalfa next.

Additional data are presented showing the lime requirement (Veitch method) of the soils under the various treatments at time of application and at two and six months' intervals. Increased soil acidity was observed wherever the green manures were added, the acidity being less for the disked crops than for the undisked. Where the crops were dried before mixing with the soil no appreciable increase in acidity was noted. In all cases liming resulted in increased yields of corn.

Does crop rotation maintain the fertility of the soil? J. E. GREAVES (*Sci. Mo.*, 6 (1918), No. 5, pp. 458-466).—The results of experiments at Rothamsted and at the Illinois, Delaware, Utah, and Canada stations, bearing on this subject, are reviewed with the conclusion that legumes in a rotation do not increase the nitrogen content of ordinary agricultural soils, even in the arid region where the nitrogen is low, when the entire crop is removed. If, however, the crop is turned under or is fed to animals, and the manure returned to the soil, the nitrogen content of the soil will be maintained and its productivity increased.

The outlook in French agriculture, L. MANGIN (*Rev. Sci. [Paris]*, 55 (1917), No. 18, pp. 545-553; *abs. in Nature [London]*, 100 (1918), No. 2518, p. 426; *Science, n. ser.*, 47 (1918), No. 1210, pp. 232, 233).—This is a report on the status and prospects of French agriculture. It shows a marked falling off since the war began of crops of wheat, potatoes, wine, and beet sugar, as well as in the production of live stock. Various steps which may be taken to encourage and increase production are suggested. Among others, "it is urged that the home production of manures should be fostered by using every measure to increase the output of sulphate of ammonia, by developing the synthetic manufacture of nitrates and ammonia from the atmosphere, and by increasing the production of superphosphate, all of which industries, it is urged, should have the same privileges as munition factories. To secure increased crops arrangements should be made for free distribution of manures to small cultivators."

Effect of fertilizers on hydrogen-ion concentration in soils, F. W. MORSE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 2, pp. 125, 126).—This article notes briefly the methods used and the results obtained in a study of the hydrogen-ion concentration of soils of plats continuously treated for 25 years with fertilizers containing acid phosphate, nitrate of soda, muriate of potash, sulphate of potash, double sulphates of potash and magnesia, sulphate of ammonia, land plaster, and agricultural lime.

"The method of procedure has been as follows: Twenty-five gm. of air-dry soil was weighed into an Erlenmeyer flask of 300 cc. capacity and 250 cc. distilled water was added. The flask was repeatedly shaken during a period of an hour and then the mixture was filtered through a dry paper filter. The first portions of the filtrate were usually cloudy and were returned to the soil flask. When the paper became well coated with soil, the filtrate would, as a rule, be clear, with the exception of some limed samples which would persistently retain a slight turbidity from clay. The soil and water were in contact for about three hours before filtration was completed.

"The colorimetric method was used for determining the hydrogen-ion concentration. The range for the soils was found to be covered by the indicators methyl red, paranitro phenol, and rosolic acid. The standard salt mixtures used were Walpole's acetic-acid-sodium acetate mixture, Sørensen's mono-

and dibasic phosphates, and Clark and Lubs' mixture of monopotassium phosphate and sodium hydroxid. The last-named covers practically the same range as Sørensen's and is much more convenient to prepare. Ten cc. of the soil solution was compared with an equal volume of the standard mixture appropriate for the concentration of hydrogen ions in the former. Small porcelain dishes served the purpose for comparisons in nearly all cases, but tubes were used when necessary to check doubtful results. . . . The range of hydrogen-ion concentrations was between $P_H-4.5$ and P_H-7 .

"Neutral salts of strong bases and strong acids, sodium nitrate, potassium chlorid, potassium sulphate, [and] calcium sulphate, produced little, if any, effect on the soil reaction in comparison with unfertilized soil. The acid phosphate, a strong base with a moderately weak acid, behaved like the neutral salts just mentioned. Sulphate of ammonia behaved like a weakly ionized acid and carbonate of lime like a weakly ionized base, and the extremes of the range were always due to these two compounds. When agricultural lime was used in conjunction with the other chemicals, it was noted that plats dressed with nitrate of soda or calcium sulphate retained the neutralizing effect of the carbonate of lime longer than the plats receiving potash salts, probably through a protective effect on the solution of the lime as bicarbonate. . . . The effect of an application of 2,000 lbs. of hydrated lime per acre is perceptible on the crop and on the soil reaction for several years, but ultimately disappears."

The peat deposits of the United States (*U. S. Geol. Survey Press Bul. 358 (1918), pp. 2, 3*).—The extent, character, and uses of these deposits are discussed. Among the agricultural uses to which attention is particularly called are use in compounding fertilizers as a possible source of ammonium sulphate and nitrates, and as a stable absorbent, deodorizer, and disinfectant.

Inorganic composition of a peat and of the plant from which it was formed, C. F. MILLER (*Jour. Agr. Research [U. S.], 13 (1918), No. 12, pp. 605-609*).—In this article, a contribution from the Bureau of Soils, U. S. Department of Agriculture, "the inorganic composition of typical samples of Everglades peat is given together with analyses of the parent material from which the peat was formed—namely, saw grass (*Cladium effusum*). Brief descriptions of both products are also given." The results of analyses of different parts of the saw grass and of saw grass peat, made on the dry material, are shown in the following table:

Inorganic composition of saw grass and Everglades peat.

Constituent.	Saw grass.				Everglades peat.			
	Leaves.	Root crowns.	Roots.	Average.	Peat 1.	Peat 2.	Peat 1a (subsoil of 1).	Peat 2a (subsoil of 2). ¹
Silica (SiO ₂).....	Per ct. 0.50	Per ct. 0.32	Per ct. 0.10	Per ct. 0.30	Per ct. 1.95	Per ct. 2.04	Per ct. 1.98	Per ct. 3.02
Iron oxid (Fe ₂ O ₃) and alumina (Al ₂ O ₃).....	.09	.08	.16	.11	.69	.60	.93	1.12
Lime (CaO).....	.59	.59	.52	.57	3.02	2.74	4.67	4.27
Magnesia (MgO).....	.12	.12	.10	.11	.43	.44	.45	.79
Soda (Na ₂ O).....	.27	.06	.14	.16	.14	.19	.19	.25
Potash (K ₂ O).....	.39	.31	.35	.35	.11	.06	.09	.06
Phosphoric acid (P ₂ O ₅).....	.08	.09	.05	.07	.13	.15	.07	.07
Nitrogen.....	.90	.89	.62	.80	3.32	3.84	2.83	2.75
Total ash.....					7.70	6.80	8.80	10.20

¹ This sample contained a small amount of extraneous sand.

"Assuming that no silica was lost during the transformation, about seven parts of saw grass were required to yield one of peat. Based on this assumption, the constituents were leached to the following extent: Iron oxid and alumina 12.2, lime 24, magnesia 41, potash 96, soda 84.6, phosphoric acid 70, and nitrogen 33 per cent.

"The losses suffered by two other common soil-forming substances, granite and limestone, are shown for the sake of comparison."

The bat guanos of Porto Rico and their fertilizing value, P. L. GILE and J. O. CARRERO (*Porto Rico Sta. Bul.* 25 (1918), pp. 66).—The manner in which different kinds of guano deposits are formed and the conditions affecting their composition in the cave are described, chemical analyses of over 200 samples are reported, and the results of about 2,300 pot experiments, conducted along lines previously noted (E. S. R., 36, p. 121), on the immediate availability of the phosphoric acid and nitrogen of guano are summarized and discussed. General conclusions are reached concerning bat guanos as fertilizers, the utilization of Porto Rico deposits, materials with which guanos should be compounded, the method of application, and the crops and soils upon which they should be used. A partial survey of the guano-containing caves of Porto Rico, made by J. H. M. Fallon, showing the amount and character of the deposits found in 110 caves is also presented.

It is stated that the material may be roughly divided into fresh bat manures, decomposed guano, and leached or phosphatic guano. Only the fresh bat manure was found to be of fairly constant composition, averaging 10.33 per cent nitrogen, 7.29 total phosphoric acid, 5.54 citrate-soluble phosphoric acid, and 2.3 water-soluble potash. Leached phosphatic guano is said to be similar, both physically and chemically, to leached guanos of bird origin. A complete mineral analysis of 25 samples failed to show any regular variation of one constituent with any other constituent. In the 222 samples analyzed for fertilizing elements only, the maximum amounts found were as follows: Total nitrogen 13.04 per cent, ammonia nitrogen 3.6, nitrate nitrogen 4.6, total phosphoric acid 41.58, water-soluble phosphoric acid 2.39, citrate-soluble phosphoric acid 28.66, and water-soluble potash 4.18 per cent. Minimum amounts of each constituent were found to be as low as 0 per cent.

Regarding the efficiency of the citrate soluble phosphoric acid in acid phosphate as 100, the efficiency of phosphoric acid in different bat guanos varied from 0 to 108. It proved to be equally available for both corn and millet. About one-half of the samples had an availability of 20 or more, comparing favorably with bone meal under similar conditions, while in general the phosphoric acid was more available than in finely ground rock phosphate. Most of the guanos were far more effective in an acid red clay than in a sandy soil. The availability of nearly all guanos relative to acid phosphate was much greater when applied six weeks before planting, the increase being deemed due to a depression in the availability of the acid phosphate, since the guanos showed practically no increase in availability by remaining in either the clay or the sand. Four of eleven guanos tested were unaffected in availability by liming, while the remaining guanos, bone meal, floats, slag, and acid phosphate, suffered a moderate to extreme loss in availability from liming. The efficiency of the guanos seemed to be unaffected by the quantity used, and the phosphoric acid was found to be as available during the early growth of corn and millet as during the later stages. In 70 per cent of the 92 samples tested there was from fair to excellent agreement between efficiencies of phosphoric acid as determined by solubility in ammonium citrate and by vegetation experiments. In most cases where agreement was poor the citrate solubility was far higher than the vegetative efficiency.

Only 91 of the 247 samples analyzed showed more than 1 per cent of total nitrogen, and in 22 of these 50 per cent or more of the total nitrogen was present as ammonia and nitrate. Vegetation experiments with 35 samples showed that nitrogen present in any other form had practically no immediate availability.

Conservative values assigned the different guanos on the basis of prices of fertilizing elements prevailing before the summer of 1914 ranged from 0 to \$17.60 per dry ton, with an average estimated value of \$7.14.

Manure heap as affected by snow, J. A. VOELCKER (*Roy. Agr. Soc. England, Occas. Notes, No. 3 (1918), pp. 3, 4*).—An analysis of manure taken from a heap in the open in October showed 67.79 per cent of water and 0.81 per cent of nitrogen. An analysis of the same manure kept in a heap in the open until April 5 and subjected in the meantime to winter frost and snow showed 74.52 per cent of water and 0.44 per cent of nitrogen.

Stable manure as a phosphatic fertilizer, J. M. GEERTS (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 9, pp. 273-321, figs. 7; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 2 (1917), pp. 49, figs. 7*).—In continuation of work previously noted (*E. S. R., 37, pp. 123, 426*), the author describes rather extensive experiments with stable manure as a source of phosphorus for sugar cane grown on soils of different phosphorus contents. The results of these tests are held to indicate that manure is an excellent phosphorus carrier for this crop, and they also confirm the results obtained with superphosphate on similar soils.

In 31 tests on phosphorus-poor soils, manure resulted in average increases of 8.06 per cent in yield of cane and 7.63 per cent in yield of sugar, while, in 68 tests on soils well supplied with phosphorus, increases of only 1.76 per cent and 1.37 per cent, respectively, were obtained. Applications of manure to soils with a low phosphorus content resulted in average increases for 35 tests amounting to 6.57 per cent for cane and 5.71 per cent for sugar. Twenty-seven tests on soils with an intermediate phosphorus content showed average increases in production in favor of the manure of 6.66 per cent for cane and 6.79 per cent for sugar.

Manure applied to light soil was not so effective as phosphates, but was effective on heavy soils. In a comparison of manure and superphosphate on phosphorus-poor soils, decided increases in production were noted in favor of manure, amounting to 6.13 per cent for cane and 5.73 per cent for sugar. Similar tests on soils of low phosphorus content showed increases of only 1.37 per cent for cane and 1.76 per cent for sugar, while on soils of unknown phosphorus content the increases amounted to 2.17 per cent for cane and 1.5 per cent for sugar, all in favor of manure.

Preliminary conclusions of experimental work to January 1, 1917, J. M. GEERTS (*Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 16 (1917), pp. 1-38, figs. 23*).—This presents a general summary, with tabulated data and with the results illustrated diagrammatically, of the fertilizer experiments for the year ended January 1, 1917, as noted above.

A new phosphatic fertilizer, "calcium tetrphosphate," E. MÈGE (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 2, pp. 90-97; Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 5, pp. 102-105*).—A phosphatic fertilizing material first prepared by Stoppani in 1911 and now produced commercially in Italy is described, and field tests conducted in Italy and France are cited in which this material was compared with phosphate rock, superphosphate, and slag for rice, wheat, oats, potatoes, clover, alfalfa, sugar beets, and turnips.

The results in general favor the so-called tetrphosphate, which is said to be more readily available than the other phosphorus carriers. The increased

availability of the tetrphosphate is thought to be due to the finely divided state of the material and to a possible molecular modification.

A more detailed account of the preparation of this product is presented elsewhere (E. S. R., 37, p. 722).

Calcium tetrphosphate, a new fertilizer, A. C. GIRARD (*Compt. Rend. Acad. Agr. France*, 4 (1918), No. 2, pp. 69-74).—This briefly reviews the experimental work noted above. The possibilities and advantages of establishing a tetraphosphate industry in France are indicated with special reference to the sulphuric acid and fuel situation and the demand for phosphatic fertilizers.

Phosphate rock our greatest fertilizer asset, W. H. WAGGAMAN (*U. S. Dept. Agr. Yearbook 1917*, pp. 177-183).—This article briefly reviews the progress made toward rendering the United States independent of other nations with regard to fertilizers, and discusses methods of mining phosphate rock, waste in mining operations, and manufacture of soluble and available phosphates.

It is stated that the progress toward economic independence as regards fertilizers is "very encouraging." This is especially true with reference to phosphatic fertilizers. According to the latest estimates of the U. S. Geological Survey the available tonnage of high-grade phosphate rock in the United States is 5,712,082,000. The author estimates that the total reserve supply of all grades of phosphate rock calculated to the high-grade equivalent is about 10,500,000,000 tons. In 1913 the United States produced 3,068,804 tons of phosphate rock, nearly one-half of the entire world's output. Since the European war began the production has been considerably curtailed, but the domestic consumption has been considerably increased. Two general processes of manufacturing soluble and available phosphates, which in the author's opinion "give promise of becoming commercially important," are discussed: (1) The production of phosphate compounds like basic slag which undergo ready decomposition under soil conditions, and (2) processes based on volatilization of the phosphoric acid from its compounds and its subsequent collection. The development of the first depends upon the extent to which it is economically practicable to use phosphatic ores in blast furnaces; and of the second, upon the possibility of finding some cheaper means than the electric furnace for volatilizing the phosphoric acid.

The sources of our nitrogenous fertilizers, F. W. BROWN (*U. S. Dept. Agr. Yearbook 1917*, pp. 139-146).—This article deals briefly with the use and extent of natural deposits of nitrogenous materials, production of ammonium sulphate, use of organic ammoniates, and fixation of atmospheric nitrogen. The conditions of increased demand, especially for munitions purposes, and consequent shortage of supply for fertilizing purposes, of nitrogen compounds since the beginning of the war and the development of new sources and processes with a view to meeting this shortage, are also discussed.

Different nitrogenous fertilizers on peat soil poor in nitrogen, H. von FELLITZEN (*Svenska Mosskulturför. Tidskr.*, 31 (1917), No. 3, pp. 267-277, figs. 4).—Several nitrogen carriers were compared in pot experiments conducted for three years with rye grass, barley, and flax. The results obtained with sodium nitrate applied as a top-dressing were taken as the standard.

All fertilizers tested were less effective than sodium nitrate in increasing the yield of barley, the least responsive being sulphate of ammonia. The addition of common salt to sulphate of ammonia had practically no influence on any of the crops. A good increase in yields of rye grass and flax was obtained from the use of a mixture of equal parts of calcium cyanamid and calcium nitrate. It was found also that this mixture was more effective than the two substances used separately. Gas-house residue, although spread out for weathering a half-year before sowing, proved totally destructive to the seed.

The value of lime on Indiana soils, A. T. WIANCKO, S. D. CONNER, and S. C. JONES (*Indiana Sta. Bul.* 213 (1918), pp. 3-14, figs. 5).—This bulletin reports the results of about 100 tests with finely ground limestone applied to various crops on seven experiment fields representing different soil types found in the State and conducted for from 1 to 12 years. The data for each field are recorded separately and briefly discussed. The average rate of application of limestone was 3.5 tons per acre and the average value of increase in crop yields \$9.31 per acre per year. For each dollar invested in limestone it is estimated that an average net profit of \$2.68 has been obtained.

Boron: Its effect on crops and its distribution in plants and soil in different parts of the United States, F. C. COOK and J. B. WILSON (*Jour. Agr. Research* [U. S.], 13 (1918), No. 9, pp. 451-470).—This paper, a contribution from the Bureau of Chemistry of the U. S. Department of Agriculture, reports experiments in continuation of those already noted (E. S. R., 34, p. 428; 36, p. 156; 38, p. 22), "dealing with the effect on the growth of crops of borax and colemanite (calcium borate) when added to horse manure in amounts sufficient to kill the larvæ of the house fly, with particular reference to the action of boron-treated manure when applied to the same soil for two or three consecutive seasons."

Experiments with wheat, barley, rye, peaches, and various vegetables are reported. Some injury, especially with the larger applications of borax, was observed with several of the crops, the effects being more marked on some soils than on others.

"There is a decided difference in soils in rendering the added boron non-toxic to plants. This is seen in the divergent results as to plant injury, etc., obtained on adding equal amounts of borax or colemanite to different soils. In some cases boron is taken up by plants from soil when no detectable quantities of boron are present in the soil samples.

"There is a complete disappearance of detectable amounts of soluble boron from soils after the addition of borax and colemanite, although small amounts of total boron are present. It is therefore evident that insoluble boron compounds are formed. In many soils there is a tendency for plants to absorb boron in proportion to the quantities added. In some soils the same amounts of boron were absorbed irrespective of the quantities added. The calcium of the colemanite did not prevent the absorption of boron, although usually more boron was absorbed by the plants when the boron was added as borax than as colemanite. The amount of boron absorbed by plants depends on the character of the soil more than on the form in which the boron was added.

"The absorption of boron by plants varies with the variety of plant, the solubility of the boron compound, the quantity of the boron compound added to the soil, the time elapsing after the compound is mixed with the soil before planting, the amount of rainfall, etc., and finally with the character of the soil to which the boron compound is added."

Fertilizers from industrial wastes, W. H. ROSS (*U. S. Dept. Agr. Yearbook* 1917, pp. 253-263).—The fertilizing materials dealt with in this article are hardwood ashes, packing-house and fish wastes, blast-furnace and cement-mill dust, phosphatic slag, cottonseed meal, and tobacco waste.

It is stated "that industrial wastes furnished about 40 per cent of the potash, 8 per cent of the phosphoric acid, and 85 per cent of the nitrogen used in this country in 1916. The potash was obtained from such wastes as tobacco stems, cottonseed hulls, hardwood ashes, wool washings, blast-furnace flue dust, cement flue dust, and sugar residues; the phosphoric acid was furnished by such materials as bones, shells, fish scrap, and basic slag; and the nitrogen was obtained from wastes in the manufacture of castor, linseed, and fish oils, from

animal wastes as blood, hair, horns, hoofs, and hides, from leather and wool wastes, from coke, and from other substances too numerous to mention."

Conservation of fertilizer materials from minor sources, C. C. FLETCHER (*U. S. Dept. Agr. Yearbook 1917*, pp. 283-288).—This article discusses briefly composting as a means of utilizing miscellaneous and waste materials for fertilizing purposes and the value of coal ashes and spoiled feeds as fertilizers, and gives tables showing the nitrogen, phosphoric acid, and potash in a large number of miscellaneous and waste materials.

Flue dust, J. A. VOELCKER (*Roy. Agr. Soc. England, Occas. Notes, No. 3 (1918)*, pp. 4, 5).—An analysis of what is considered a good sample of flue dust showed total potash 5.99 per cent, and potash soluble in water 2.65 per cent. Attention is, however, called to the fact that flue dust is very variable in potash content, a sample guaranteed to contain 5.4 per cent being found to contain only 2.46 per cent.

Inspection of commercial fertilizers, 1917, P. F. TROWBRIDGE (*Missouri Sta. Bul. 154 (1918)*, pp. 44, fig. 1).—This reports the guaranteed and actual analyses of 475 official samples of commercial fertilizers and fertilizing materials, representing 181 different brands collected during 1917. Deficiencies in plant food were found as follows: Nitrogen 26.6 per cent of the samples analyzed, total phosphoric acid 10.4 per cent, available phosphoric acid 26.1 per cent, and potash 53.3 per cent. The samples analyzed showed, as a whole, an average valuation of \$1.58 per ton above the manufacturer's guaranty. The power of limestone and similar materials to neutralize soil acidity is expressed in percentage of calcium carbonate for 194 samples tested. A list of the brands registered for sale in 1918 is included.

AGRICULTURAL BOTANY.

The raw materials of the plant kingdom, J. VON WIESNER (*Die Rohstoffe des Pflanzenreiches. Leipzig: W. Engelmann, 1918, 3. ed., rev. and enl., vol. 2, pp. IX+864 (+ ?), figs. 170*).—This is the second volume of the revision begun by the author and continued after his death by T. F. HANAUSEK and J. MOELLER. The plan of the work is similar to that previously noted (*E. S. R.*, 36, p. 628), the present volume treating of starches, algae, lichens, galls, barks, and woods found in commerce or capable of utilization.

Agricultural bacteriology, H. W. CONN, rev. by H. J. CONN (*Philadelphia: P. Blakiston's Son & Co., 1918, 3. ed., rev., pp. X+357, figs. 63*).—This is a revised edition of the work previously noted (*E. S. R.*, 21, p. 420). Extensive changes have been made in the chapters on soil bacteriology, control of milk supplies, plant diseases, and laboratory technique, with minor changes in other chapters.

Relation of the density of cell sap to winter hardiness in small grains, S. C. SALMON and F. L. FLEMING (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 10, pp. 497-506, pl. 1).—To determine the possible relation between the density of cell sap and the ability of plants to survive low temperatures, the authors conducted a series of experiments at the Kansas Experiment Station with winter rye, wheat, emmer, barley, and oats.

These tests seem to indicate that there is no relation between the cryoscopic value of the extracted sap of these plants grown in fields under normal conditions and their ability to resist winterkilling. Turgidity of the tissue as influenced by physiological drought appears to have more influence than the kind of grain on the concentration of the cell sap. For tender plants of the same varieties grown in the greenhouse, a definite relation between the freezing point of the cell sap, the turgidity of the tissue, and resistance to low tempera-

ture seems to be indicated. This relation for plants grown in the field will also hold true in the fall and early winter and following periods of mild weather during the winter.

See also the abstract of contribution by Salmon on page 441.

Chemistry and histology of the glands of the cotton plant, with notes on the occurrence of similar glands in related plants. E. E. STANFORD and A. VIEHOEVE (Journ. Agr. Research [U. S.], 13 (1918), No. 8, pp. 419-436, pls. 9).—This paper, which is a contribution from the Bureau of Chemistry of the U. S. Department of Agriculture, is the second of a series giving the results of a chemical and biological investigation of the cotton plant, the purpose of the study being the isolation and determination of substances which attract the boll weevil. The previous paper (see p. 411) reports the presence of glucosids and the products of their hydrolysis, as well as studies of an ethereal oil in the cotton. Both glucosids and oil are said to be localized in prominent internal glands which are very numerous in all parts of the cotton plant. The purpose of this paper is to discuss the occurrence, formation, structure, and contents of the glands. In addition to occurring in cotton, internal glands are said to be present to some extent in the related genera *Thespesia*, *Cienfuegosia*, *Erioxylon*, and *Ingenhouzia*. The glands described in this paper differ morphologically from the nectaries occurring in the cotton.

The flavones of *Rhus*. C. E. SANDO and H. H. BARTLETT (Amer. Jour. Bot., 5 (1918), No. 3, pp. 112-119).—A study of three species of *Rhus* is said to confirm the view that the same flavone is not likely to be found in both wood and leaves of the same species. Fisetin is considered a wood flavone, probably an end product of metabolism. It has now been found in *R. cotinus*, *R. rhodantha*, *R. typhina*, and *R. glabra*, the first two of these being considered as not belonging to *Rhus* in the restricted sense but rather to the genera *Cotinus* and *Rhodosphæra*, respectively. The distinctive leaf flavone of *Rhus* proper is myricetin, formerly reported in *R. coriaria* and now known to exist in *R. glabra* and *R. copallina*.

On the formation of nodules in the cortex of *Hevea brasiliensis*. G. BRYCE (Ann. Roy. Bot. Gard. Peradeniya, 6 (1917), No. 4, pp. 257-290).—Concluding a review and report on this subject, the author states that nodules are produced in the cortex of *H. brasiliensis* as a result of alteration in the latex vessel content, apparently due to physiological changes in the latex itself. The trouble is limited to certain trees apparently predisposed thereto. Four types of nodules are noted. Globular shoots are distinguished from nodules by the absence of a core and by not forming a large mass of woody tissue.

Nodules do not occur on untapped trees. They are found on *Hevea* in Brazil, in tropical America, and in the eastern Tropics, but the percentage of trees developing nodules is small. Tapping appears to favor nodule formation. The trouble is not infectious.

The morphology and cytology of the sexual organs of *Phytophthora erythroseptica*. P. A. MURPHY (Ann. Bot. [London], 32 (1918), No. 125, pp. 115-153, pls. 2).—The author presents the results of a study of the development and structure of *P. erythroseptica*, of which study the cytological aspect is prominent. The close relationship, cytologically, of *Phytophthora* to *Sclerospora* and *Plasmopara* and especially to *Pythium* is pointed out. It is suggested that this series is a gradually ascending one, leading from the generalized type of sexual reproduction in the Ancylistales, where the whole contents of both organs unite to form the oospore, to the more specialized type of *Peronospora*, where a portion of the protoplasm of the oogonium remains permanently outside the oospore.

A demonstration of photosynthesis, W. J. V. OSTERHOUT (*Amer. Jour. Bot.*, 5 (1918), No. 3, pp. 105-111, figs. 2).—Apparatus is described which is claimed by the author to allow the operator to remove at intervals satisfactory samples of the gases surrounding the leaf, to stir and mix the gases when necessary, and to analyze the gases by a simple method which is at the same time sufficiently accurate for ordinary purposes. The apparatus is said to be easily constructed and kept in order. The method described is applicable to the study of the influence of reagents on respiration and photosynthesis.

A simple method of measuring photosynthesis, W. J. V. OSTERHOUT and A. R. C. HAAS (*Science*, n. ser., 47 (1918), No. 1217, pp. 420-422).—A description is given of a method for measuring minute amounts of photosynthesis at frequent intervals that is said to be very simple, accurate, rapid, and convenient. It consists essentially of placing aquatic plants in solutions containing bicarbonates with a little phenolphthalein and observing changes in the color of the indicator.

Experimental studies of self-incompatibilities in fertilizers, A. B. STOUT (*Proc. Soc. Expt. Biol. and Med.*, 15 (1918), No. 4, pp. 51-54).—Having pursued studies in self-incompatibility as regards fertilization in *Oichorium intybus* during six years (E. S. R., 38, p. 236), the author gives a general summary of results and conclusions regarding various phases of the subject.

It is stated that self-incompatibilities and cross-incompatibilities are strongly in evidence in this species, that self-compatible plants may arise sporadically from parents that are self-sterile even after three generations of self-incompatible ancestry, that the progeny of such plants do not breed true to this character, that the degree of self-compatibility varies greatly, and that selection for high degrees of self-fertility continued during four generations has not been effective in isolating a completely self-fertile strain. Self-compatibility and self-incompatibility are entirely independent of differences in vegetative vigor. They operate independently of potential sex vigor and also independently of the purely nutritive relations of the embryos to their parent plants. They appear independently of any combination of germ plasma elements in so far as these can be judged by the expression of characters. Either may occur in cross-bred or inbred races. Results here obtained are said to show that self-incompatibility and self-compatibility are here not to be described as dominant and recessive characters, or paired allelomorphs, and that there is no simple Mendelian formula that fits observed results.

The evidence regarding the behavior of similar phenomena in other species is said to be in agreement with this conclusion. The conditions controlling sex fusions apparently arise in connection with the development of sex organs and sex cells as such. In this sense the controlling factors are of epigenetic and individual development. The factors which determine or prohibit successful fertilization in chicory, whatever their essential nature may prove to be, are regarded as highly variable as to degree, specificity, and transmission in heredity. The phenomenon of incompatibility appears to present some analogy to that of so-called antigen-antibody reactions in immunity and to isoagglutination and isoprecipitation phenomena.

Mass mutation in *Zea mays*, H. DE VRIES (*Science*, n. ser., 47 (1918), No. 1219, pp. 465-467).—After a discussion of mass mutation in *Oenothera* as described by Bartlett (E. S. R., 35, p. 128), the author gives an account of what he considers the same phenomenon in maize. In 1889 he described in the *Botanisch Jaarboek* of the Society *Dodonæa*, Ghent, Belgium, a form of maize to which was given the name *Zea mays sterilis*. This form appeared in some cultures of the plant and was characterized by having neither branches, lateral stems, ears, ramifications of the spike, nor male flowers. It continued to show

itself in the same strain for six generations. In the eighth generation, 19 per cent of the plants belonged to the new type. The sudden appearance of this type of maize is considered an example of mass mutation, and sterile varieties, yellow seedlings, etc., occurring in other genera are believed to be examples of the same phenomenon.

The chemical investigation of some poisonous plants in the natural order Solanaceæ, IV, V, J. M. PETRIE (*Proc. Linn. Soc. N. S. Wales*, 42 (1917), pt. 1, pp. 118-135, 137-145).—The first of these articles gives an account of a study of *Duboisia myoporoides* and *D. hopwoodii* (the two species of this genus which are best known) as regards some of their chemical components with their physiological effects, also the total alkaloids in each plant. The results are presented in tabular form.

In the second article, the author presents some special studies on *D. leichhardtii*, said to be endemic in eastern Australia, though not so well known as the two species described above. It was found that the leaves of this species contain a mixture of the midriatic alkaloids, amounting to 1.4 per cent of the plant material dried at 100° C. or 0.28 per cent of the fresh plant. *D. leichhardtii* closely resembles *D. myoporoides* as regards its alkaloids, both of these species in this respect contrasting markedly with *D. hopwoodii*, the pituri plant, which contains nicotine.

New or noteworthy plants from Colombia and Central America, VII, H. PITTIER (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 20 (1918), pt. 3, pp. X+95-132, pl. 1, figs. 19).—This is the seventh number of a series by the author on the plants of Colombia and Central America.

FIELD CROPS.

[Report of field crops work on the Yuma reclamation project experiment farm in 1916], R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1916, pp. 13-19, 22-31, figs. 5*).—This reports the continuation of work previously noted (*E. S. R.*, 36, p. 133), including cultural, irrigation, variety, and selection tests with cotton and variety tests with alfalfa, grain sorghums, oil crops, and miscellaneous forage crops.

Of the 23 varieties of both long and short staple cotton tested, Durango with an average yield of 1,761 lbs. of seed cotton per acre was the leading long staple variety and Acala with 2,620 lbs. was the leading short staple variety. A furrow-and-bed system of planting cotton, devised in an effort to eliminate losses through faulty irrigation, is described in which planting is done in lister beds, the rows being situated just above the water line on both sides of a broad furrow, thus escaping flooding during irrigation, while the water easily reaches the roots of the plant. The maximum yield of seed cotton, 1,840 lbs. per acre, was obtained from plantings made in beds 5.5 ft. wide with the rows 24 in. apart across the furrow. The principal advantages claimed for the method embrace the following points: (1) The possibility of irrigating to force germination without crusting the soil over the seed; (2) avoiding excessive early irrigation; (3) pickers may return to work in the field very soon after irrigation by following the high beds; (4) lodged plants fall on dry ground, thus reducing the loss from decayed and damaged bolls; and (5) the practice renders possible a more economical use of irrigation water.

Hairy-leaved Peruvian alfalfa has produced the highest yield, 4.8 tons per acre, as compared with 4 tons per acre from common Chilean, 3 tons from Grimm, and 2.5 tons from Arabian. The production of alfalfa seed, said to be the second most important crop industry on the project, is discussed.

Dwarf hegari with 43 bu. per acre and Shrock kafir with 31 bu. were the leading grain sorghum varieties tested. Observations on the optimum distance of spacing the plants in the row are held to indicate that the closest spacing, 4 to 6 in., will give the highest yield.

Tests with flax grown under irrigation indicate that the highest yields are obtained from seedlings made in 18-in. rows, with light cultivation between the rows after each irrigation. The highest yield, 23.8 bu. per acre, was obtained from C. I. No. 3 grown in this manner. Yields of castor beans and peanuts were obtained amounting to 574 and 1,395 lbs. per acre, respectively.

Meadow fescue, awnless brome grass, tall oat grass, timothy, perennial rye grass, and alsike clover were sown on irrigated pastures during November, 1915. All made slow growth and proved to be inferior to Sudan grass. The highest-yielding varieties of miscellaneous crops tested during 1916 for both forage and seed production were as follows: Millet, Pearl with 6.2 tons of forage per acre and Ragi with 451 lbs. of seed; sweet sorghum, Honey with 22.2 tons of green forage and Orange with 1,963 lbs. of seed; cowpeas, Monetta with 13.89 tons of green forage and Early Red with 442 lbs. of seed; soy beans, Mammoth with 3.5 tons of green forage and Black Eyebrow with 320 lbs. of seed; and common vetch with 2.8 tons of green forage. Hyacinth, tepary, moth, and jack beans and Chinese velvet beans produced yields of green forage ranging from 4.87 to 15.9 tons per acre. Hyacinth, kult, and tepary produced seed at the rate of 895, 810, and 612 lbs. per acre, respectively. Brief notes are presented on leading varieties of field peas grown as winter green manure crops.

[Report of field crops work in Florida], J. M. Scott (*Florida Sta. Rpt. 1917*, pp. 28-34).—Fertilizer tests with Japanese cane, corn, and sweet potatoes; variety tests with corn for silage; and field tests with flax are described for the year ended June 30, 1917, in continuation of work previously noted (E. S. R., 37, p. 635).

Japanese cane continued to show a marked decrease in yield as compared with the first year of the fertilizer experiments (1914), the check plats appearing to decrease in about the same proportion as the fertilized plats. An application of thirty 2-horse wagon loads of barnyard manure gave the highest average yield of green material, 19.8 tons per acre, for the three years 1914 to 1916, inclusive. The maximum yield from a complete fertilizer amounted to 13.7 tons per acre with an application of 84 lbs. sulphate of ammonia, 150 lbs. acid phosphate, and 60 lbs. sulphate of potash, together with 2,000 lbs. ground limestone. Where only two fertilizer elements were applied, the highest yield, 9.1 tons per acre, was obtained from an application of 84 lbs. sulphate of ammonia and 60 lbs. sulphate of potash. With the application of only one element, 116.6 lbs. nitrate of soda gave a maximum yield of 9 tons per acre. The 1916 yield of cane from land replanted in 1915, with the same fertilizer treatment, showed a marked decrease as compared with the 1915 yield. The highest average yield for the two years, 25.4 tons per acre, was obtained from the plat receiving 112 lbs. dried blood and 84 lbs. muriate of potash, while the lowest yield, 10.9 tons, followed an application of 112 lbs. dried blood and 224 lbs. acid phosphate.

In fertilizer tests with corn, the yields ranged from 19.2 bu. per acre, for an application of 112 lbs. dried blood, 84 lbs. sulphate of potash, 224 lbs. acid phosphate, and 2,000 lbs. ground limestone to 27.4 bu. for the same treatment without the limestone.

An application of 72 lbs. sulphate of ammonia, 84 lbs. muriate of potash, and 224 lbs. acid phosphate resulted in a maximum yield of sweet potatoes

of 244.2 bu. per acre for the two years 1915 and 1916, while the lowest yield, 93 bu., followed an application of 112 lbs. dried blood and 224 lbs. acid phosphate.

Mexican June, Martin Improved, Blount Prolific, and Hastings Prolific corn produced yields of green silage amounting to 6.6, 7, 9, and 11.7 tons per acre, respectively. Blount Prolific matured from 10 days to 2 weeks earlier than the other varieties.

Flax sown in December, 1916, and January, 1917, is said to have germinated well, but from 90 to 95 per cent winterkilled. The remaining plants made a good growth.

[Report of field crops work in Kentucky, 1916], G. ROBERTS (*Kentucky Sta. Rpt. 1916*, pp. 22, 23).—This briefly notes progress in cultural tests with corn, wheat, and alfalfa.

Cultivating corn beyond the stage at which it is usually laid by failed to increase the yield. Deep and shallow cultivation are said to have given similar yields, and scraping off the weeds gave as good results as any method of cultivation. Wheat drilled in rows 8 in. apart yielded more than 1 bu. per acre above that drilled in 4-in. rows. Subsoiling for alfalfa failed to give any decided increase in yield. Ground limestone applied at a minimum rate of 4 tons per acre is recommended for land to be sown to alfalfa.

[Report of field crops work at the Duluth substation, 1917], M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917*, pp. 5-7, 8-11).—This reports the continuation of work along the same general lines as that previously noted (*E. S. R.*, 37, p. 228). Weather conditions for the season of 1917 are described as unfavorable to pastures, forage crops, and potatoes, while grain and root crops did well.

The average yields of oats over the 3-year period 1915 to 1917 were 51 bu. for Minnesota No. 26, 49 bu. for Minnesota No. 295, 43 bu. for Minnesota No. 281, 42.5 bu. for White Russian, and 40 bu. for Minnesota No. 261. The length of the growing period varied from 103 days for Minnesota No. 261 to 133 days for White Russian. Minnesota No. 105 barley, with a 2-year average yield of 23.5 bu. per acre, was highest. The time required to grow the barley crop varied from 104 days for White Hull-less to 111 days for Princess. In variety tests with field peas, the 1917 yields amounted to 16.6 bu. for Arthur, 16 bu. for Alaska, 13.3 bu. for Marrowfat, and 12.4 bu. for common. The growing period varied from 104 days for Alaska and common to 124 days for Arthur. Hay yields were obtained as follows: Old pasture grown up to timothy 1.13 tons per acre, 2-year-old seeding 1.6 tons, and 1916 seedings 1.94 tons. Early Ohio potatoes grown from seed obtained from different parts of the State produced yields ranging from 174.35 bu. per acre for seed from Faribault (southern Minnesota) to 230.83 bu. for seed from Grand Rapids (northern Minnesota). Corn, buckwheat, proso, and Siberian millets failed to mature, while flax matured in 105 days and spelt in 118 days. American Purple Top rutabagas outyielded other varieties.

Fertilizer tests begun in 1916 have been continued, and the yields of potatoes, rutabagas, and oats obtained in 1917 are reported in tabular form. Average maximum yields secured with the different treatments were as follows: Potatoes 173.67 bu. per acre from manure and acid phosphate, rutabagas 14.81 tons from manure alone, and oats 62.63 bu. from acid phosphate alone.

[Report of field crops work at the Morris substation, 1916] (*Minnesota Sta., Rpt. Morris Substa., 1916*, pp. 5-18).—This reports the progress of work conducted along the same general lines as that previously noted (*E. S. R.*, 37, p. 229). The crop season of 1916 is described as one of the poorest in the history of western Minnesota.

The average maximum yields of corn, wheat, oats, and clover grown in rotation with different fertilizer treatments were as follows: For corn 51.2 bu. from both rock phosphate and manure and acid phosphate and manure, for wheat 11 bu. from rock phosphate and manure, for oats 47.3 bu. from acid phosphate alone, and for clover 3.2 tons from rock phosphate and manure. On plats treated with manure and acid phosphate 66 per cent of the oats lodged, as compared with 45 per cent on the acid phosphate plats and only 17 per cent on the checks.

In fertilizer tests with alfalfa begun in 1915, the highest yield, 4.77 tons per acre, was obtained from acid phosphate alone. The untreated checks yielded at the rate of 3.84 tons.

Wheat, barley, and corn grown in an 8-year rotation with alfalfa produced average yields of 16.3, 31.06, and 46.1 bu. per acre, respectively, on plats grown to alfalfa the 4 preceding years. Barnyard manure applied at the rate of 0, 4, 8, 16, and 32 tons per acre in a rotation of corn, wheat, barley, and clover resulted in yields of corn amounting to 38.5, 48, 43, 42.5, and 35 bu. per acre, respectively. Corn receiving 0, 1, and 2 ton applications of wheat straw yielded at the rate 33.2, 34.4, and 29.7 bu. per acre, while wheat receiving 0, 1, and 2 ton applications of corn stover produced 9.1, 8.4, and 7.9 bu. per acre, respectively.

Cultural and seeding tests with alfalfa were begun in 1915. Early spring seeding (April 17) without a nurse crop gave the highest yield in 1916, 4.02 tons per acre. In variety tests with alfalfa, Grimm with a 3-year average yield of 6,814 lbs. per acre, Kansas with 6,551 lbs., and Baltic with 6,305 lbs. were highest.

Seeding tests with clover begun in 1915 indicated that the best results are to be had with wheat as a nurse crop. Northwestern Dent, Minnesota No. 13 (Morris selection), and Minnesota No. 23 with respective yields of 46.6, 43, and 29.25 bu. per acre were the only corn varieties to attain maturity.

The spring wheat variety tests were practically a failure, due to rust, scab, and heat blight, while the winter wheat varieties winterkilled from 50 to 100 per cent and also suffered severely from rust and blight.

The highest yielding sorts of other crops grown in variety tests were as follows: Minnesota No. 369 oats with 45 bu. per acre, Chevalier barley with 25.9 bu., White spring spelt with 42.5 bu., Minnesota No. 2 winter rye with 10 bu., spring rye with 22.6 bu., Minnesota No. 25 flax with 15 bu., Siberian millet for seed with 34.5 bu., and German millet for forage with 5.1 tons per acre.

[Report of field crops work at the Morris substation, 1917], P. E. MILLER (*Minnesota Sta., Rpt. Morris Substa., 1917, pp. 5-33, figs. 9*).—This reports further progress along the lines of work noted above. The season of 1917 was generally favorable for all crops except corn.

The first course of the rotation of corn, wheat, oats, and clover, grown with different fertilizer treatments, was completed with this season, and the results are presented in tabular form. Maximum yields were obtained as follows: Corn 42.2 bu. with rock phosphate and manure, wheat 27.2 bu. with acid phosphate alone, oats 71.4 bu. for both rock phosphate and manure and manure alone, and clover 2.97 tons with rock phosphate and manure. The increase in crop values above the cost of the fertilizer varied from —42 cts. for rock phosphate alone to \$10.12 for acid phosphate alone.

Fertilizer and crop rotation tests with alfalfa and crop rotation experiments with different crops employing barnyard manure and crop residues gave results similar to those obtained in 1916. In the clover utilization test the maximum corn yield, 44.3 bu. per acre, was obtained where the first crop was cut for

hay and the second crop pastured, although the differences in yield between the various treatments were comparatively small.

The highest-yielding varieties of different farm crops were as follows: Wisconsin No. 1 oats with 85.5 bu. per acre, Bluestem spring wheat with 23.8 bu., Minnesota No. 2 winter rye with 30.9 bu., spring rye with 31.2 bu., Wisconsin No. 55 barley with 57.2 bu., Minnesota No. 177 flax with 17.8 bu., White Cap Yellow Dent corn with 76.3 bu. (nearly mature), White spring spelt with 47.4 bu., Grimm alfalfa with 3.19 tons, and Irish Cobbler potatoes with 246.8 bu.

Seeding tests with alfalfa and clover are briefly noted with results similar to those noted above.

Field crops [in Ontario] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 42 (1916), pp. 35-39).—Field tests with potatoes, oats, barley, winter wheat, mixed grains, and hardy alfalfa, and with root crops for seed are briefly noted for 1916.

[Report of field crops work in St. Lucia, 1916-17], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Lucia, 1916-17*, pp. 7-9).—Field tests of recently imported sugar cane varieties are briefly noted and their yields compared with those of such standard varieties as White Transparent and B. 6450.

Ba. 6032 is deemed the most promising of the new varieties tested, yielding 31.77 tons of cane per acre in 1915, as compared with yields of 20.44 tons for White Transparent and 26.2 tons for B. 6450. Other promising new varieties are Ba. 7924 and B. H. 10 (12).

[Report of field crops work in the Turkestan and Transcasian districts (Russia) for 1912], M. M. BUSHUEVA, V. S. MALYGINA, A. I. A. MUKHINA, and P. A. KOZIKA (*Dept. Zeml. [Russia], Otchetny Opytn. Khlopkov. Uchrez. Turkest. i Zakaspi. Oblasti, 1912*, pp. 355, pls. 21, fig. 1).—A detailed report of cultural and fertilizer experiments with cotton, together with field tests with alfalfa, corn, winter wheat, *Phaseolus mungo* as a green manure, oats, fodder beets, beans, rice, sorghum, clover, winter barley, and sunflowers conducted at three experimental centers.

Crops of southern France, Algeria, Tunis, and Morocco, C. RIVIÈRE and H. LECQ (*Cultures du midi de l'Algérie, de la Tunisie et du Maroc. Paris: J. B. Baillière & Sons, 1917*, pp. VIII+9-483, figs. 106).—A revised and augmented edition of a work previously noted (E. S. R., 17, p. 1058).

[Culture experiments on moor lands], H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr.*, 31 (1917), Nos. 1, pp. 16-42; 2, pp. 129-169).—The experiments reported were conducted in 1915 by the Swedish Moor Culture Association at Flahult and Torestorp in Jönköping.

Mixing the surface layer of imperfectly decomposed peat soil with sand gave an increase in yield of hay in a five-year test. The application of the sand had paid for itself with the third cutting. In 1915 the sanded plats gave an increase in returns at the rate of 73.93 crowns per hectare (\$8.08 per acre).

Shallow bog soils mixed or covered with sand responded favorably to the treatment in the production of barley in 1915, the sand-covered plats giving the greater yields of straw and grain. Similar treatments given a deep bog soil in another locality resulted in a higher yield of turnips on the sand-mixed plats, on which drought injury to the plants was not so apparent as on the sand-covered plats.

On a peat soil better yields of oats were secured with the use of barnyard manure than with the application of commercial fertilizers, the manure furnishing the greater quantity of plant food, especially of nitrogen. The use of lime on a peat soil with a fair lime content indicated that the various species

of grass grown responded differently to the treatment. The use of liquid manure containing 1.25 gm. of nitrogen per liter on grass land increased the yield of hay by 8.3 kg. per hectoliter applied (11 oz. per gallon). Nitrate of soda and sulphate of ammonia were of equal value as sources of nitrogen for turnips on sandy soil. Common salt applied with sulphate of ammonia was not perceptibly effective. An application of 200 kg. of nitrate of soda per hectare (178 lbs. per acre) on moor soils proved most economical.

The results of other fertilizer experiments in progress for five years on moor soils indicated that nitrogenous fertilizers, on account of the high nitrogen content of the soil, remained without effect. The use of cyanamid, however, appeared to have been somewhat injurious. Of three phosphorus carriers Thomas slag gave the best results, with superphosphate standing second and bone meal third, and of three potash fertilizers 20 per cent potash salt ranked first in effectiveness, kainit second, and 37 per cent potash salt last. In 1915 nitrogenous fertilizers had no effect on the yield of oats, but the use of 450 kg. of superphosphate on the phosphorus series of plats and of 260 kg. of 37 per cent potash salt on the potash series gave profitable results.

Early seeding of turnips was found preferable to late seeding. The best yields of rye were secured from seedings made at the end of August. Sowing oats toward the close of May gave a marked reduction in yield as compared with earlier sowing. Barley also gave small yields from late sowing, but the reduction was not so marked as with oats. Leguminous crops grown for green fodder were not influenced much by late seeding. Late planting of potatoes resulted in smaller yields, the reduction being greater with the late than with the early varieties. Seed potatoes produced on peaty soil of a high nitrogen content as compared with those grown on sandy soil gave the better returns on each of these soil types.

Variety tests of different crops are reported. Svalöf Yellow barley on peaty soils as compared with Primus gave much the better yield of grain. On upland moor soil Svalöf Crown, Probsteier, and Victory oats gave the highest yields, ranking in the order given. German Yellow oats gave yields about as high as those of Probsteier, but the period of growth was about 10 days shorter. Of three varieties of field peas Solo gave the best results as compared with Sand and Svalöf 0632.

On sandy soil 36 varieties of potatoes gave an average yield of 24 tons of tubers per hectare (9.6 tons per acre). The highest yields in 1915 were secured from Graham Midsummer and The Factor, which produced over 30 tons per hectare. The late as compared with the early varieties showed the highest starch content.

Of several varieties of turnips Munich ranked first in yield, being followed by Braate and Bortfeld. The last mentioned variety had the smallest percentage of diseased roots and also proved to be the best keeper. Munich produced the largest quantity of dry matter per unit area, but May turnip stood first in dry matter content, with an average of over 12 per cent as compared with from 8 to 9 per cent for the other varieties. The highest yield of carrots was secured from Champion, but James produced the larger quantity of dry matter.

A grass mixture consisting of alsike clover 10 per cent, timothy 30 per cent, meadow foxtail 50 per cent, and blue grass 10 per cent gave the highest average yield for five years and proved better adapted to the moor soil and climatic conditions than other mixtures grown in comparison.

A number of disinfectants were applied to soil on which peas had begun to make poor growth even under generally favorable conditions. The use of chlorid of lime resulted in a marked reduction in yield. A coal tar preparation

also depressed the yield to some extent, but copper sulphate produced no injurious effect and even seemed to have favored growth. On all the treated as compared with the untreated soils leguminous plants with seed inoculation produced the greatest number of root nodules.

West country grass lands, WINIFRED E. BRENCHLEY (*Jour. Bath and West and South. Counties Soc.*, 5. ser., 11 (1916-17), pp. 85-112, figs. 4).—The author reports observations made on a tour of representative areas of grass land in Gloucestershire and Somerset, England, during the summer of 1916 to obtain definite information regarding the weeds of grass land. Detailed notes were made on 340 fields in addition to many more fields examined superficially in connection with special points of interest.

The areas surveyed have been divided into five groups, according to the general nature of the soil, and the flora of each group briefly discussed. Observations are also noted on the effect of herbage on stock, weeds harmful to stock, milk, or both, weeds requiring special attention, weeds and grasses of interest, vegetation of special areas, fairy rings, and the improvement of grass land.

Pasture management, W. M. JARDINE and R. KENNEY (*Bien. Rpt. Kans. Bd. Agr.*, 20 (1915-16), pp. 179-188, figs. 3).—The authors briefly outline the so-called "deferred and rotation grazing system" developed in the grazing studies of the Forest Service of the U. S. Department of Agriculture and discuss its application in improving native pasture lands in Kansas. This system is regarded as a possible substitute for the practice of burning over pasture lands in the early spring.

Range preservation and its relation to erosion control on western grazing lands, A. W. SAMPSON and L. H. WEYL (*U. S. Dept. Agr. Bul.* 675 (1918), pp. 35, pls. 6, figs. 8).—The authors discuss rather fully the causes and effects of erosion on grazing lands in the West and recommend remedial and preventive measures based largely upon observations begun in 1912 on two representative areas subject to flooding on the high summer range of the Manti National Forest in central Utah. The results of these studies are deemed applicable to many mountain ranges in Utah, Wyoming, Idaho, Nevada, Arizona, and New Mexico, and to a less extent in other western States.

Factors determining the amount of erratic run-off and erosion are enumerated as melting snow, rain, wind, and vegetative cover. The relation of erosion and soil depletion to vegetative growth and to revegetation and the influence of grazing upon erosion and stream flow are also discussed.

"While topography, climate, and soil are the primary factors in determining erosion, the combination of these factors on the lands under consideration is such that erosion is slight where the native ground cover has not been greatly disturbed. The seriousness of the erosion, therefore, is largely determined by the extent to which the ground cover is maintained. Serious erosion on western range lands is due chiefly to the destruction of the vegetation as a result of overgrazing and mismanagement of live stock. The sum of conditions favoring destructive run-off and erosion is most pronounced in the fan-shaped drainage basins of the spruce-fir type (on the Manti National Forest between 9,000 and 10,500 ft.), where the ground cover is naturally rather sparse, where there is a characteristic sparseness of tree growth, and where the most desirable summer sheep ranges are located.

"To maintain an effective vegetative cover, overgrazing and too early cropping of the herbage must be avoided, deferred and rotation grazing should be applied, and stock should be properly controlled and distributed at all times in the season. In the case of incipient erosion, only slight changes in the use of the lands are generally necessary, and these changes do not necessarily imply even a temporary financial loss. Where erosion has had full play for a number

of years, the reestablishment of the ground cover, even though grazing is discontinued, does not always afford adequate protection. In such instances, which fortunately are relatively rare in this country, a combination of terracing and planting or, in exceptional cases, the construction of dams is justified."

Grasses of the West Indies, A. S. HITCHCOCK and AGNES CHASE (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 18 (1917), pt. 7, pp. XVIII+261-471).—This presents a brief descriptive list and key to the grasses of Bermuda, the Bahamas, Trinidad, and Tobago, based primarily upon a study of collections in the U. S. National Herbarium, together with certain other important herbaria, the specimens contained therein being considered in defining the range of the different species.

Curing hay on trucks, H. B. McCURE (*U. S. Dept. Agr., Farmers' Bul.* 956 (1918), pp. 18, figs. 11).—The author describes the construction and manipulation of a truck, devised by J. E. Evans, to be used in supporting hay during the curing process in order to protect it from rain and from moisture in the ground. The device was planned primarily for use in certain regions of the South and Southeast where rainy or cloudy weather is more or less prevalent during the haying season, and it is said to make reasonably certain the production of a good quality of hay even during unfavorable weather conditions. The amount of man and horse labor involved is deemed to be no greater than that required by the usual methods of curing hay in these localities, and while the initial cost may appear high, it is estimated that at present prices of Johnson grass hay, the total cost of the trucks, including interest, repair, and depreciation charges, is repaid by a saving over other methods of less than 1 per cent of a single crop. The truck is also said to be adapted for use in curing alfalfa hay and for the protection of cereal crops before thrashing.

[Cover crops for Porto Rico], C. F. KINMAN (*Porto Rico Sta. Bul.* 19 (1918), Spanish Ed., pp. 30, pls. 8).—This is a Spanish edition of work previously noted (*E. S. R.*, 34, p. 736).

Comparative transpiration of corn and the sorghums, E. C. MILLER and W. B. COFFMAN (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 11, pp. 579-604, pls. 2, figs. 13).—This is a further contribution by the Kansas Experiment Station to a study of the water relations of corn and sorghum (*E. S. R.*, 37, p. 637) describing experimental work done at Garden City during the summers of 1916 and 1917 in an effort to determine the daily transpiration of these plants. The plants used in 1916 included Pride of Saline corn, Dwarf Blackhull kafir, Dwarf milo, and Blackhull kafir. In addition to these, in 1917 Sherrod White Dent corn, Freed White Dent corn, Red Amber sorgo, Freed sorgo, and feterita were used. The plants were grown in large galvanized iron cans containing about 120 kg. of soil each. The soil used in 1916 had a water content of 18 per cent and a wilting coefficient of 11.1, while that used in 1917 had a moisture content of 22 per cent and a wilting coefficient of 15.1. In 1916 the cans were placed in the open on the surface of the ground, while in 1917 they were placed in a pit in the center of a plat of corn, the tops of the cans being on a level with the surface of the ground. In most of the experiments the transpiration was determined every two hours from 7 a. m. to 7 p. m., each experiment extending through two or three days. The data are presented in tabular form and expressed graphically for each experiment. The results obtained may be summarized as follows:

The amount of water transpired per plant in a given period stood, with the exception of Dwarf Blackhull kafir in 1917, in the same relative order as the extent of leaf surface, but was not proportional to it. Blackhull kafir and Dwarf Blackhull kafir always showed the lowest rate of transpiration per unit of leaf

surface, while all the varieties of corn always transpired more water per plant during any given period than any of the sorghums. The rate of transpiration per unit of leaf surface for corn was, with the exception of the kafirs, always much lower than that of the sorghums. The rate of transpiration per unit of leaf surface for feterita, Dwarf milo, Freed sorgo, and Red Amber sorgo was much higher than that of corn under the same conditions. This difference was more marked when the plants had reached their full leaf development and the difference in leaf surface of the plants had reached a maximum. The difference in the transpiration rate per unit of leaf surface was also more evident under severe climatic conditions than under conditions where the evaporation was low.

"The results of these experiments with corn and the sorghums seem to indicate that in most cases a small leaf surface is the most important factor in reducing the loss of water from these plants. The corn plant is not capable of supplying its large extent of leaf surface with a sufficient amount of water to satisfy the evaporating power of the air, and as a result its rate of transpiration per unit of leaf surface falls below what it would be if the needed amount of water was supplied. The sorghums, on the other hand, with their small leaf surface are able to supply water in amounts sufficient to satisfy the evaporating power of the air, and, as a result, their rate of transpiration per unit of leaf surface is higher than that of the corn."

Why cereals winterkill, S. C. SALMON (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 8, pp. 353-380).—This paper, a contribution from the Kansas Experiment Station, is intended to suggest the probable causes of winterkilling and presents a comprehensive review of experimental work and of general observations as a basis for further study. Winterkilling is attributed to four general causes, namely, heaving, smothering, physiological drought, and the direct effect of low temperature on the plant tissue and protoplasm. External conditions which modify the degree of injury are indicated as follows: Duration and intensity of cold; rate of freezing and thawing; protection by (1) snow, (2) mulches, (3) vegetative cover, and (4) uneven surface of the ground; moisture content and kind of soil; and habit of growth of the plants. Internal factors which may modify the degree of injury include the moisture content of tissue, dormancy, concentration of sap, size of cells, means for controlling transpiration, and the age of plants or the maturity of tissue.

A bibliography of 79 titles is appended.

Field bean production, E. V. HARDENBURG (*Cornell Reading Course for the Farm*, No. 124 (1917), pp. 269-300, figs. 12).—This is a detailed discussion of the field practices and cultural methods employed in the production of the common field bean (*Phaseolus vulgaris*) in New York, with brief reference to bean diseases and insect pests.

Standard broom corn, B. E. ROTHGEB (*U. S. Dept. Agr., Farmers' Bul.* 958 (1918), pp. 20, figs. 7).—The nature, use, and climatic adaptation of broom corn is discussed. The cultural methods and field practices employed in growing the crop and the preparation of the brush for market are described. Diseases affecting the crop and methods of treatment are noted.

Delbridge cotton seed calculator, C. L. DELBRIDGE (*St. Louis, Mo.: The Delbridge Co.*, 1917, pp. 81).—This gives tables for calculating the value of any amount of cotton seed from 10 to 3,000 lbs., within the limits of from \$60.25 to \$80 per ton, and supplements similar tables previously noted (*E. S. R.*, 37, p. 137).

Cynodon dactylon and its application in binding shifting soils, A. BORZI (*Bol. R. Giard. Colon. Palermo*, 3 (1916), No. 3-4, pp. 101-116, pls. 2).—A detailed discussion on the use of *C. dactylon* for binding shifting soils, previously

referred to by the author (E. S. R., 37, p. 333) in connection with a study of a number of grasses deemed suited for that purpose.

Fibers from various sources (*Bul. Imp. Inst. [So. Kensington], 15 (1917), No. 1, pp. 7-23*).—This briefly reports an examination of samples of the following fibers at the Imperial Institute: Jute from Egypt, Rhodesia, and Nyasaland; *Sida rhombifolia* from South Africa; nettle from India; sisal from Rhodesia; Furcræa from Rhodesia and South Africa; *Asclepias fruticosa* from South Africa; kapok from the Sudan and Togoland; and seed hairs of *Ipomœa albivenia* from South Africa.

Mangel variety trials (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1916, pp. 84-86; Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916-17), pp. 209-211*).—In a test of a number of varieties of mangels at several experimental centers in 1916 Smithfield Yellow Globe was highest with 49.15 tons per acre, and Golden Tankard lowest with 24.1 tons.

Present status of the peanut industry, H. C. THOMPSON (*U. S. Dept. Agr. Yearbook 1917, pp. 113-126, pls. 5*).—The production of peanuts in the United States is described and a brief discussion presented on the peanut-butter industry, the manufacture of peanut oil, the use of peanuts for roasting and by confectioners and bakers, and on peanuts as feed for live stock. The future for the industry is said to be very promising.

Potato culture under irrigation, W. STUART, C. F. CLARK, and G. W. DEWEY (*U. S. Dept. Agr., Farmers' Bul. 953 (1918), pp. 23, figs. 16*).—This describes the cultural methods and field practices employed in growing potatoes under irrigation in Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. It is estimated that on approximately 50 per cent of the land planted to potatoes in 1909 in these States the crop was grown with irrigation. Control measures for insect pests and diseases are indicated, and brief notes are presented on seed selection, potato storage, and marketing.

The germinability of winter rye harvested during different periods of its growth and maturation, R. G. ZALENSKIĖ (*Zhur. Opytn. Agron. (Jour. Agr. Expt.), 17 (1916), No. 6, pp. 432-445, figs. 3*).—The author, in reviewing the results of germination studies with winter rye harvested at different periods, concluded that winter rye germinated even in the initial stages of its growth before morphologically mature and that it was unnecessary for the grain to remain unthreshed during the time required for complete maturation, although maturation was better attained when the spike was left without thrashing until air-dried. Morphologically mature grain required a certain period of rest for a physiological "ematuration," after which the germinative power showed normal variations. Drying fresh grain harvested in the green state at a temperature of 50° C. (122° F.) destroyed its vitality, while drying diminished the germinating power and vitality of grain harvested in the milk stage and later. When the grain remained sufficiently long in the resting stage, its germinability and vitality were improved if the grain was ripe at time of harvest. Grain that ripened in the spike after harvest conserved its germinability much better than that which was threshed immediately after harvest. The lowering of germinability and vitality which occasionally manifested itself might be explained as an incomplete maturation of the grain, caused by cold, moist weather.

The soy-bean industry in the United States, W. J. MORSE (*U. S. Dept. Agr. Yearbook 1917, pp. 101-111 pls. 6*).—This briefly outlines the early history of the soy-bean industry and describes the production and use of the crop in the United States, including its utilization in various forms as forage, oil, and

meal, and as human food. The possibilities of the industry in this country are noted.

A method of identification and description of sugar cane varieties, and its application to types grown in Porto Rico, H. B. COWGILL (*Jour. Dept. Agr. P. R.*, 1 (1917), No. 3, pp. 119-140, pls. 9; *La. Planter*, 59 (1917), Nos. 21, pp. 332, 333; 22, pp. 348-350).—The author briefly indicates the distinguishing characteristics of the stalk, internode, node, bud, and foliage of sugar cane employed in the identification of varieties, and defines certain special terms used in describing sugar cane varieties grown at the Porto Rico Insular Experiment Station. Twenty-six varieties are described, using these characteristics and terms.

Sugar supply of the United States, F. ANDREWS (*U. S. Dept. Agr. Yearbook 1917*, pp. 447-460).—The author presents statistics on sugar consumption in the United States and discusses the principal sources of supply, including Hawaii, Porto Rico, the Philippines, and Louisiana; the domestic production of beet sugar; and such minor sources of supply as maple sugar and sirup; honey; cane, sorghum, and corn sirups; glucose; grape sugar; etc.

The cane sugar industry (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Misc. Ser. No. 53* (1917), pp. 462).—A comprehensive report on the cost of production of sugar in Hawaii, Porto Rico, Louisiana, and Cuba is submitted.

A study of Colorado wheat, IV, W. P. HEADDEN (*Colorado Sta. Bul. 244* (1918), pp. 1-8).—These pages present a brief review of the most important conclusions reached in previous studies (*E. S. R.*, 37, p. 38) by way of introduction to observations made on the bread making and other properties of the wheats and flours produced in the course of the experimental work together with some flours produced from Colorado wheats by various mills in the State. The results of these observations are noted on page 469.

The world's supply of wheat, O. C. STINE (*U. S. Dept. Agr. Yearbook 1917*, pp. 461-480, figs. 3).—Statistical data are presented and discussed, showing the world's production and acreage of wheat before and after the beginning of the war and the effect of the war upon international trade in wheat. War measures taken in different countries in regard to stimulating wheat production and the present wheat situation among the allies are also noted.

The weed problem in American agriculture, H. R. CATES (*U. S. Dept. Agr. Yearbook 1917*, pp. 205-215, pls. 5).—The harmful effects of weeds are described and methods for their eradication and control briefly outlined.

The seed supply of the Nation, R. A. OAKLEY (*U. S. Dept. Agr. Yearbook 1917*, pp. 497-536, pls. 4, figs. 2).—This is a comprehensive discussion of the seed situation in the United States, with particular reference to the sources of supplies of seeds of the cereals, grasses, legumes, fiber crops, vegetables, and miscellaneous field crops, such as sugar beets, flax, and broom corn.

[Report of seed testing and inspection in Kentucky, 1917], H. GABMAN (*Kentucky Sta. Rpt. 1917*, pp. 38-43).—This presents a brief general review of work done by the seed laboratory in connection with the recently enacted seed law. A total of 3,126 miscellaneous samples of seed were received from seedsmen and farmers, 184 samples were collected by inspectors, and 371 samples of tobacco seed were received for grading. The results of purity and germination tests of representative samples of grass, clover, millet, soy beans, oats, and rape seed are recorded.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr.*, 2 (1918), No. 1, pp. 8).—The principal feature of this number is an address delivered by W. A. Wheeler before the annual convention of the American Seed Trade Association held in Chicago, June, 1918, on Seed Reporting as a Public Service. Brief articles by

E. Brown on germination of crimson clover seed and by E. A. Back on the protection of seed from insect injury by the use of carbon disulphid are also presented.

Information is noted relative to the prospects for orchard grass seed, Kentucky blue grass seed, meadow fescue seed, onion sets, and vegetable seed crops, and regarding the movement from farmers' hands of different forage crop seeds throughout the principal producing sections. The usual statistics of recent imports of forage plant seeds permitted entry into the United States are included.

HORTICULTURE.

[Horticultural investigations on the Yuma Reclamation Project in 1916], R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1916, pp. 32-40, figs. 4*).—The usual progress report on cultural and variety tests of orchard and small fruits, vegetables, and ornamentals, including cultural suggestions (*E. S. R.*, 36, p. 137).

[Report on fruits, vegetables, and ornamentals], P. E. MILLER (*Minnesota Sta., Rpt. Morris Substa., 1917, pp. 33-37, figs. 2*).—Brief notes are given on the condition of vegetables, fruits, and ornamentals tested at the West Central substation in 1917.

New methods of plant breeding, G. W. OLIVER (*in Híbridicultura y Otros Trabajos de las Estaciones, 1917. Madrid: Estac. de Ensayo de Semillas, 1917, pp. 7-46, pls. 15, figs. 2*).—A Spanish translation of Bulletin 167 of the Bureau of Plant Industry of the U. S. Department of Agriculture (*E. S. R.*, 22, p. 633).

Diseases and pests of garden plants, M. VAN DEN BROEK and P. J. SCHENK (*Ziekten en Beschadigingen der Tuinbouwgewassen. Groningen: J. B. Wolters, 2. ed., 1918, vol. 1, pp. XV+402, figs. 173; 1917, vol. 2, pp. VIII+250, figs. 74*).—The present edition of this work (*E. S. R.*, 36, p. 236) is somewhat revised and enlarged.

War gardens, F. W. JENKINS (*Bul. Russell Sage Foundation Libr., No. 28 (1918), pp. 4*).—A bibliography of special articles and reports dealing with emergency gardening and not including books and bulletins on the subject of gardening.

Saving seeds for the home and market garden, R. W. PETERSON and E. C. VOLZ (*Michigan Sta. Circ. 35 (1918), pp. 4*).—This circular discusses the causes of seed shortage and gives instructions for growing seeds of a number of vegetables at home.

Vegetable growing (*Mass. Bd. Agr. Bul. 5, 3. ed., rev. (1918), pp. 193, pls. 16, figs. 13*).—A revised edition of this bulletin (*E. S. R.*, 35, p. 341).

Tests of some imported garden legumes, J. A. COCANNOWER (*Philippine Jour. Sci., Sect. A, 13 (1918), No. 2, pp. 67-95*).—The author reports a variety test of a large number of American beans and peas. The tests were conducted to determine what varieties were most productive under Philippine conditions and what season of the year was best adapted for their production, and also to secure seed for pedigree selection work.

Loading and transporting western cantaloups, A. W. MCKAY (*U. S. Dept. Agr., Bur. Markets Doc. 10 (1918), pp. 16, figs. 8*).—In continuation of a previous document showing the influence of picking and handling on the waste and decay of cantaloups on the market (*E. S. R.*, 39, p. 240), the present document discusses the influence of loading methods and modifications of car construction in retarding or accelerating refrigeration. The suggestions given are based upon investigations conducted during the seasons 1915 to 1917. The important phases discussed include effect of mixed loading on refrigeration,

temperatures in transit, floor racks, ear construction and insulation, the use of salt as an aid to refrigeration, and miscellaneous practices affecting refrigeration.

An account of the genus *Capsicum* grown in the Central Provinces and Berar, K. P. SHRIYASTAVA (*Dept. Agr. Cent. Prov. and Berar [India] Bul. 5 (1916), pp. 25, pls. 7*).—The chilies grown in the Central Provinces and Berar are here discussed with reference to the importance of the industry, exports and imports, chief centers of cultivation, cultural details, improvement of types, germination of seed, and morphological characters. Eleven distinct types resulting from selective studies are illustrated and described, and suggestions are given relative to improvements possible in the chili and cultural methods.

Common edible and poisonous mushrooms of Ontario, R. E. STONE (*Ontario Dept. Agr. Bul. 263 (1918), pp. 24, figs. 20*).—A descriptive account of the edible mushrooms of Canada, including also descriptions of the deadly poisonous types. Methods of gathering wild mushrooms, precautions to be taken to avoid poisonous forms, and recipes for using mushrooms are also given.

Tomato growing in Michigan, C. W. WAID (*Michigan Sta. Spec. Bul. 89 (1918), pp. 3-18, figs. 9*). A practical treatise on the culture, care, and marketing of tomatoes, including a list of varieties recommended for planting in Michigan.

The use of explosives in the tillage of trees, J. R. MATTERN (*New York: Inst. of Makers of Explosives, 1918, pp. 78, figs. 72*).—A manual of information relative to the handling and use of explosives with special reference to orcharding.

A consideration of the question of "bulk" pruning, V. R. GARDNER (*Proc. Oreg. State Hort. Soc., 30 (1915), pp. 55-61*).—This paper has been noted from another source (*E. S. R., 38, p. 510*).

Pollination of fruits, W. W. CHENOWETH (*Ann. Rpt. Vt. State Hort. Soc., 15 (1917), pp. 7-17*). A popular review of American investigations of the pollination of fruits.

Australian Pomological Conference (*Fruit World Austral., 19 (1918), No. 5, pp. 106-108, fig. 1*). A preliminary report of the conference, including a list of apple and pear varieties and their names as approved by the pomological committee.

[Report on] orchard trials, M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917, pp. 7, 8*). A brief statement showing the relative hardiness during the severe winter of 1916 of a number of varieties of young apple trees, together with notes on the condition of small fruits being grown at the station.

The fertilization of apple orchards, J. P. SREWART (*Pennsylvania Sta. Bul. 153 (1918), pp. 3-31, figs. 2*). In continuation of previous reports on orchard experiments (*E. S. R., 38, p. 42*) this bulletin reports six fertilizer experiments in bearing orchards that have been carried on since 1907-8.

During a ten year period nitrogen has been influential in improving both yield and growth in five of the six experiments. In the two most responsive orchards, with nitrate of soda or its equivalent at \$100 a ton, the average gains from nitrogen during nine and ten year periods have been secured at a fertilizer cost of less than 9 cts. per bushel of fruit. Nitrogen from commercial sources or from stable manure has proved more effective than that from cover crops as a rule. The beneficial influence of nitrogen has shown no signs of reduction at the close of the ten-year period.

Neither phosphorus nor lime when used alone has shown any important influence on either yield or growth in apples. It is pointed out, however, that phosphorus is generally valuable in connection with leguminous covers and

that lime also may be of indirect value when used with cover crops and as an accompaniment of fertilizer applications. Potash has increased the yields materially in three of the orchards and has apparently shown some value in increasing the average size of the fruit. It has also apparently had an injurious effect in two of the experiments. At present prices, the largest increase in yield through potash applications was secured at a fertilizer cost of 40 cts. per bushel of fruit.

The addition of phosphorus or potash to nitrogen applications has usually given larger returns than nitrogen alone. In two experiments the nitrogen and phosphorus combination gave average annual increases per acre of 265 and 308 bu. of fruit during nine- and ten-year periods. In three of the orchards the addition of phosphorus has resulted in no benefit. In at least one experiment no type of fertilization has yet given a profitable return, although the chemical fertility of the soil in this case is lower than in that of any of the other experiments. The data from the experiments as a whole have failed to show any definite correlation between soil composition and the actual response of the associated trees to additional fertilization.

A comparison of carriers has revealed no important difference between the various forms of potash and phosphorus, except that the evidence favors phosphorus in the form of acid phosphate in the absence of tillage. Nitrate of soda has shown some advantage over other nitrogen carriers, especially where quick action and solubility are important.

The red color in apples has not been materially increased by any form of fertilization. The distinctly retarding influence of nitrogenous fertilizers and manure on color is attributed solely to delayed maturity which, it is pointed out, is often an advantage in the case of the more northern varieties such as Baldwin, Hubbardston, and McIntosh, when grown in Pennsylvania. With York Imperial and similar long season varieties, however, it may be necessary to use nitrogen more sparingly and to utilize such direct aids to color as open pruning, late picking, and sod culture.

Generally speaking, fertilization has been more influential in increasing the total amount of fruit and foliage than in increasing the size of the fruit. Heavy crops induced by fertilization had a tendency to reduce the average size of fruit. It is believed that the plant food factor is less important in controlling size than moisture conservation and proper thinning. Manure, chiefly because of its moisture-conserving effect, usually secured a fair increase in the size of fruit.

The results of the study as a whole indicate that a good local test properly conducted is the surest and safest guide to sound practice in orchard fertilization. Plans for such a test are given. When an orchard appears to need some fertilization at once the use of about 500 lbs. to the acre of a 6:8:5 fertilizer or about 8 tons of manure annually is recommended. On an individual tree basis the author suggests the use of nitrate of soda 4 to 8 lbs., acid phosphate 6 to 10 lbs., and muriate of potash, when available and apparently needed, 2 to 3 lbs. per mature tree. Attention is called to the value of applying available plant food early in the season, especially soluble nitrogen, such as nitrate of soda, very soon after the buds start and before the blossoms open, experiments at the Ohio and Oregon stations having shown that applications at this time make decided increases in the crop of the same year (E. S. R., 36, p. 40; 35, p. 540).

Pear growing in California, G. P. WELDON (*Mo. Bul. Cal. Com. Hort.*, 7 (1918), No. 5, pp. 219-410, pls. 4, figs. 186).—A practical treatise on pear culture, with special reference to California. It deals with varieties; trees, stocks, and

propagation; selection and care of trees for planting; distance and systems for planting and number of trees per acre; soils and their preparation for planting; setting and caring for the young trees; pruning; irrigation, cultivation, cover crops, fertilizers, intercrops; grafting the pear; frost injury and frost protection; spraying the pear; bacterial and fungus diseases of the pear; insect, mite, and animal pests of the pear; thinning, picking, and packing; canning and drying pears; and insecticides and fungicides.

Pear v. quince root for the Bartlett, W. P. TUFTS (*Mo. Bul. Cal. Com. Hort.*, 7 (1918), No. 6, pp. 416-419, figs. 2).—During the spring of 1908, 85 Bartlett pear trees were planted in the university orchards at Davis, Cal. Of these trees 50 were on quince stock and the remaining 35 on French seedling stock. Observations on the subsequent growth of these trees led to the conclusions that the quince root is not a congenial stock for the Bartlett pear under the soil and climatic conditions existing in the university orchards, and that the quince has relatively little dwarfing effect on the Bartlett pear.

Plums and cherries, J. OSKAMP (*Indiana Sta. Bul.* 212 (1918), pp. 3-12, figs. 8).—This bulletin discusses and gives directions for growing plums and cherries, including the control of diseases and insects. A descriptive list of varieties that have fruited on the station grounds and of those specially recommended for planting in Indiana is also given.

Strawberry notes, W. R. BALLARD (*Maryland Sta. Bul.* 211 (1918), pp. 51-76, figs. 3).—This bulletin gives brief cultural directions for growing strawberries, discusses the raising of new varieties, and gives the results of variety tests conducted at the station for the years 1912 to 1917, inclusive. Descriptions are also given of some of the newer varieties, together with notes on strawberry diseases, by J. B. S. Norton, and on insects affecting strawberries, by E. N. Cory.

Observations on direct bearers in the Vaudois vineyard in 1917, H. FÄRS (*Prog. Agr. et Vit. (Ed. VEst-Centre)*, 39 (1918), No. 27, pp. 10-12).—In continuation of the previous report (*E. S. R.*, 34, p. 234) notes are given on a large number of direct-bearing grapes in experimental vineyards under the direction of the Viticultural Station of Lausanne.

The grafting stocks of some hybrids, PÉE-LABY (*Vie Agr. et Rurale*, 8 (1918), No. 23, pp. 392-394).—Notes are given relative to the suitability of various grape species as stocks for different French hybrid vines.

A new graft hybrid, F. LA MARCA (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 16, pp. 647-649).—In 1914 the author observed black-fruited olives growing on white-fruited trees some 40 years old that had been grafted on black-fruited stocks. The black olives occurred in different situations on different trees. In one case, of three shoots starting from the same point, one bore black and the other two bore white olives. Measurements of pits, leaves, and peduncles, as well as an analysis of the oil from the three forms, showed an intermediate relation between the variant and the stock and scion. Since this phenomenon has been repeated for four years, the author concludes that asexual hybridization following combinations of certain stocks and scions is a reality.

Statistics on olive production for the year 1917 (*Estadística de la Producción Olivarera en el Año 1917. Madrid: Govt.*, 1918, pp. 6).—A statistical report on the area in olive trees and the production of olives and olive oil in the various regions and Provinces in Spain, with a comparative summary for the last five years.

Citrus fruit improvement: A study of bud variation in the Washington navel orange, A. D. SHAMEL, L. B. SCOTT, and C. S. POMEROY (*U. S. Dept. Agr. Bul.* 623 (1918), pp. 146, pls. 19, figs. 16).—Studies of citrus fruit improvement

that were started by the senior author in 1909 have shown that the commercial citrus varieties such as the orange, lemon, and grapefruit, respectively, are subject to a great amount of variability arising from bud variation (E. S. R., 34, p. 639; 36, p. 537; and 38, p. 541). Practical methods for locating the desirable and undesirable trees in groves and for transforming the latter when found are described in Farmers' Bulletin 794 (E. S. R., 37, p. 144).

The present paper describes in detail the study of bud variation as determined for the Washington navel orange by means of individual tree performance records and observations. The history is given of the Washington navel variety, and the plan of the investigations, the methods of keeping performance records, and some of the important strains under study are described in detail. Notes are also given on individual fruit variations and minor variations of the fruits. Detailed statements are given of the annual performances of 35 representative Washington navel orange trees for which records were obtained for six years, 1910 to 1915, inclusive; also of 64 representative trees for which records were obtained for four years, 1912 to 1915, inclusive. Summarized statements are also given of other plats of Washington navel trees.

Of the various strains of Washington navel oranges under observation the Washington strain is considered to be the most important and valuable. The Thomson strain is also of value and it is believed that the Golden Nugget, Yellow Washington, and Yellow Thomson strains may prove of value for commercial orchards. All of these strains described can be isolated through bud selection based on individual tree performance records. It is pointed out that the undesirable strains usually have been propagated unintentionally by reason of a lack of knowledge of their existence and importance. Fruit bearing bud wood with representative fruits attached should be used for propagation purposes.

Citrus fruit improvement: A study of bud variation in the Valencia orange. A. D. SHAMEL, L. B. SCOTT, and C. S. POMEROY (*U. S. Dept. Agr. Bul.* 624 (1918), pp. 120, pls. 14, figs. 9).—A bulletin similar to the above dealing specifically with bud variation in the Valencia orange.

As with the Washington navel orange the Valencia has shown great variability under bud variation. The most valuable strain of this variety is the Valencia. It is believed that certain other strains, here described, may be of value under certain conditions.

Citrus experimental grove. S. E. COLLISON (*Florida Sta. Rpt.* 1917, pp. 95-97).—In continuation of previous reports (E. S. R., 37, p. 649) measurements are given showing the average gains in diameter of trees from June, 1909, to June, 1917, growing on the various fertilizer plats in the citrus experimental grove.

Observations were made in connection with a freeze occurring in February, 1917, with special reference to the effects, if any, of the various fertilizer treatments in making the trees more or less resistant to cold. Although no conclusive data were obtained, it was evident that those trees which were in a weakened and unthrifty condition when the cold struck them suffered much more than the thrifty trees. This unhealthy condition was due largely to the fertilizer treatment received.

The mulched basin system of citrus culture. J. F. BREAIZEALE (*Cal. Citrogr.*, 3 (1918), No. 10, pp. 232, 246, figs. 2).—A descriptive account of the mulched basin system of growing citrus trees.

Our colonial agriculture.—XI, Cacao. W. ROEPKE (*Onze Koloniale Landbouw.—XI, Cacao.* Haarlem: H. D. Tjeenk Willink & Son, 1917, pp. VIII+164, figs. 56).—A handbook on the cacao tree and its products similar to that on tea noted below.

Our colonial agriculture.—X, Coconut culture, H. R. ROELFSEMA (*Onze Koloniale Landbouw*.—X, *De Kokos-cultuur*. Haarlem: H. D. Tjeenk Willink & Son, 1916, pp. VII+102, figs. 41).—A handbook similar to the above on the coconut palm and its products.

Our colonial agriculture.—VII, Coffee culture, J. HAGEN (*Onze Koloniale Landbouw*.—VII, *De Koffiecultuur*. Haarlem: H. D. Tjeenk Willink & Son, 1917, 2. ed., pp. [VI]+90, figs. 38).—A handbook similar to the above on the coffee tree and the coffee industry.

Shade for coffee in Laguna, T. G. CALINGASAN (*Philippine Agr. and Forester*, 6 (1918), No. 8, pp. 213-229).—A comparative study, conducted under the direction of the Philippine College of Agriculture, of the growth of different varieties of coffee at low, medium, and high altitudes in shade and in the sun is reported. A brief bibliography of cited literature is appended.

Our colonial agriculture.—VI, Tea culture, J. J. B. DEUSS (*Onze Koloniale Landbouw*.—VI, *De Theecultuur*. Haarlem: H. D. Tjeenk Willink & Son, 1915, 2. ed., pp. VIII+104, pl. 1, figs. 56).—This is one of a series of twelve popular handbooks on the agricultural products of Netherlands Indies, edited by J. Dekker. Consideration is given to the history, botany, chemical composition, culture, varieties, diseases, insects and other troubles, and manufacture and quality of tea, including statistics on the world's production, trade, and consumption of tea.

The cultivated fruits and nuts of Trinidad and Tobago, W. E. BROADWAY (*Bul. Dept. Agr. Trinidad and Tobago*, 17 (1918), No. 1, pp. 19-28).—Brief notes are given on the extent of culture, importance, and adaptability of various fruits and nuts grown in Trinidad and Tobago.

Production of drug-plant crops in the United States, W. W. STOCKBERGER (*U. S. Dept. Agr. Yearbook 1917*, pp. 169-176, pls. 4).—A brief review of the present status of the drug-plant industry in the United States.

The perpetual flowering carnation, M. C. ALLWOOD (*London: The Cable Printing & Publishing Co., Ltd.* [1918], pp. 112, pls. 12).—A pocket edition of the author's larger work on the commercial culture of the perpetual flowering carnation, which is now out of print.

Fern culture, J. F. HUSS (*Jour. Internat. Gard. Club*, 2 (1918), No. 2, pp. 181-186, figs. 2).—Methods of propagating and caring for ferns, especially those adapted for house culture, are described.

Orchid breeding, D. LUMSDEN (*Jour. Internat. Gard. Club*, 2 (1918), No. 2, pp. 203-212, figs. 5).—The author describes a method of germinating orchid seeds which was developed in connection with breeding studies now under way. His germination tests have led to the conclusion that immediately after germination has taken place development of the plant can not proceed unless in the presence of a mycorrhizal root fungus. Work is now being undertaken in cooperation with H. Lebowsky to endeavor to obtain pure cultures of the symbiotic fungi in orchid roots. The method of procedure is described in detail. Out of a series of about one hundred cultures only two organisms have thus far occurred with any noticeable regularity.

Peony culture in America, A. P. SAUNDERS (*Jour. Internat. Gard. Club*, 2 (1918), No. 2, pp. 157-180, figs. 12).—A popular review of progress made in the introduction, dissemination, and improvement of peonies in America.

The peony, B. H. FARR (*Trans. Mass. Hort. Soc.*, 1918, pt. 1, pp. 65-79).—Notes are given on the classification and culture of peonies.

Landscape gardening in its relation to roadside planting, O. C. SIMONDS (*Jour. Internat. Gard. Club*, 2 (1918), No. 2, pp. 187-201, figs. 6).—A discussion of roadside planting with the view of producing natural landscape effects.

A shade tree guide, A. GASKILL (*Trenton, N. J.: Dept. Conserv. and Develop., 1918, pp. 22, figs. 13*).—A guide to municipal authorities and others in the planting and care of shade trees in which consideration is given to street trees, lawn trees, and seashore trees. Although the advice given refers particularly to New Jersey it is believed to be applicable to most of the eastern United States.

Measurements taken of some specimen trees in Christchurch Botanic Gardens, J. YOUNG and T. W. ADAMS (*Jour. Canterbury Agr. and Past. Assoc., 3, ser., 6 (1918), pp. 21-26*).—Data are given showing the height and girth in 1918 of specimen trees of a large number of species growing in Christchurch Botanic Gardens, New Zealand.

Trees, shrubs, and plants for farm and home planting, C. P. HALLIGAN (*Michigan Sta. Bul. 281 (1918), pp. 3-52, figs. 41*).—A guide to the planning and planting of the home grounds, including planting plans, cultural suggestions, and lists of shrubs, trees, vines, and perennial and annual plants for special purposes.

FORESTRY.

An Australian study of American forestry, E. H. F. SWAIN (*Brisbane, Queensland: Dept. Pub. Lands, 1918, pp. IV+138+XVIII, figs. 29*).—This comprises a memoir of an investigative tour of the forest regions in the western United States in 1916, including a series of suggestions based on a combined Australian-American experience for the extension of forestry systems in Australia.

The forest taxation law of Connecticut, W. O. FIDLEY (*N. Y. Forestry, 5 (1918), No. 2, pp. 20, 21*).—A brief analysis of operations under the forest taxation law of Connecticut since its passage in 1913.

The forest classification law of Massachusetts, F. W. RANE (*N. Y. Forestry, 5 (1918), No. 2, pp. 22-24*).—An analysis similar to the above of operations under the forest classification law of Massachusetts.

The forests of Plymouth County, J. J. MORRIS (*Boston, Mass.: State, 1918, pp. 48, pls. 4, figs. 29*).—The results of a forest survey of Plymouth County, Mass., are here presented in tabular form and discussed.

A memorandum on the law relating to forestry, B. W. ADKIN (*Quart. Jour. Forestry, 12 (1918), No. 3, pp. 154-163*).—A review of the British forestry law, including recommendations suggested for making the law adaptable to recently introduced methods of silviculture.

Timber industry, P. GROOM (*Jour. Roy. Soc. Arts, 66 (1918), No. 3424, pp. 515-527*).—A paper delivered before the Royal Society of Arts, and dealing largely with the extent to which technical science can aid, and has aided, in promoting the timber industry and the utilization of the timber resources of the British Empire.

Report of the forestry division, R. D. FORBES (*Bien. Rpt. Dept. Conserv. La., 1917-18, pp. 37-64, pls. 2, figs. 13*).—A progress report on activities along the line of forest fire protection, forest extension, and educational work, including a summary of the forest resources of the State and plans for future forestry work.

Experiments conducted on the Urania forest preserve have shown beyond a doubt that long-leaf pine will reproduce abundantly when given protection against hogs and fire. Fire protection alone proved to be sufficient to secure short-leaf and loblolly pine reproduction.

Studies conducted on this preserve by Yale forestry students indicate that trees smaller than 9, or 10 in. on the stump and producing no larger than a 7-in. log are utilized at a loss by the average mill and should be left standing

in the woods. It was found that trees 8 in. in diameter, breast high outside of the bark, left after logging in 1900 made a rapid growth when the surrounding trees were removed and averaged 12 in. in diameter in 1917.

Report of the forestry service for the year 1916-17, G. C. PICHÉ (*Rpt. Min. Lands and Forests Quebec, 1917, pp. 23-67*).—A progress report on the administration and management of the crown forests of Quebec, including a summary of activities along the line of reforestation, nursery work, forest education, and technical studies. Data relative to work done in connection with the white pine blister rust, timber cut, revenues, and a special report on forest fire protection are appended.

Division of forestry.—Annual report, C. S. JUDD (*Hawaii. Forester and Agr., 15 (1918), No. 6, pp. 145-156*).—A brief report on the work of the division of forestry for the calendar year 1917, with special reference to forest protection and forest extension.

One new forest reserve was added during the year, bringing the total acreage in reserve up to 800,094, of which 68.5 per cent is owned by the Territory.

Forestry as applied in Hawaii, C. S. JUDD (*Hawaii. Forester and Agr., 15 (1918), No. 5, pp. 117-123, pls. 4*).—A paper on this subject delivered before the Social Science Association of Honolulu, May 6, 1918.

Second contribution to the knowledge of the trees of Argentina, M. LILLO (*Segunda Contribucion al Conocimiento de los Arboles de la Argentina. Tucuman: Univ. Tucuman, 1917, pp. 69*).—This contribution continues the work previously noted (*E. S. R., 24, p. 343*) by presenting notes on the Venturi herbarium, corresponding to the collection of timber species.

Preliminary volume table for Scots pine (*Jour. Bd. Agr. [London], 25 (1918), No. 3, pp. 326, 327*).—The table here given was compiled from 540 felled trees measured by officers of the British Board of Agriculture engaged in the collection of statistics as to the rate of growth of timber.

The influence on latex of the water used for dilution, and its bearing on early coagulation during dilution, J. C. HARTJENS (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 4, pp. 163-186; Meded. Proefstat. Malang, No. 21 (1918), pp. 24*).—An inquiry into lump forming in certain gardens and early coagulation of the latex when diluted was conducted on a rubber estate in the Malang Southern Watershed. The results indicate that the early coagulation was brought about by the presence of a high content of lime salts in the water used for diluting. Hence it is suggested that rubber estates on calciferous soils, where much trouble is caused by curdling and early coagulation of the latex, ought to give up standardizing their bulked latex if the water used for dilution shows a high content of lime salts.

Tapping and tapping experiments on the east coast of Sumatra, A. A. L. RUTGERS (*Arch. Rubbercult. Nederland. Indië, 2 (1918), Nos. 3, pp. 133-151, figs. 6; 4, pp. 196-201*).—An account of tapping experiments and observations made on various estates on the east coast of Sumatra.

Significance of resinous tracheids, S. J. RECORD (*Bot. Gaz., 66 (1918), No. 1, pp. 61-67, figs. 5*).—As a result of his investigations relative to the significance of resinous tracheids, the author concludes that "resinous tracheids in gymnosperms find numerous parallels in the angiosperms, that they represent one form of reservoir for excretions, and that the form of the resin masses is in response to well-known physical laws. No direct functional activity is attributed to the resin plates, although they are in certain ways analogous to tyloses and reduce the permeability of the wood. As a diagnostic feature resinous tracheids appear of value in *Pinus albicaulis* and may prove to be so in other cases."

A further note on the antiseptic treatment of timber, recording results obtained from past experiments, R. S. PEARSON (*Indian Forest Rec.*, 6 (1918), No. 4, pp. VII+128, pls. 14).—This note records progress made in the antiseptic experiments that were started several years ago (E. S. R., 27, p. 148), and also records the data secured from more recent experiments.

The subject matter is presented under the following general headings: Previous records and objects of the investigation; the results of laboratory experiments; results of field experiments; timber treated by the open-tank process; miscellaneous field experiments carried out with sleepers treated in open tanks; records of experiments carried out in pressure plants with Indian and other varieties of timber; factors governing the treatment of timber; and general discussion of the treatment of timber in India. A list of publications and reports dealing with the antiseptic treatment of timber is appended.

Production of lumber, lath, and shingles in 1916, F. H. SMITH and A. H. PIERSON (*U. S. Dept. Agr. Bul.* 678 (1918), pp. 43, figs. 3).—This bulletin gives detailed statistics on the production of lumber, lath, and shingles in 1916 with comparisons with previous years. The data given include production by classes, by mills, by States, and by kinds of wood.

The estimated total production of lumber in the United States during 1916 was 40,000,000,000 ft. b. m., or approximately 5 per cent greater than in 1915. The quantity actually reported by 17,269 active mills was 34,791,385,000 ft. b. m.

DISEASES OF PLANTS.

Plant diseases [in 1916], R. H. BIFFEN (*Jour. Roy. Agr. Soc. England*, 77 (1916), pp. 218-220).—Notes are given referring to cereal diseases, mostly due to such fungi as *Leptosphaeria*, *Ophiobolus*, *Cladosporium*, and *Septoria*. Other diseases of cereals include ergot, bunt, mildew, and "blind" ears (*Helminthosporium*). Diseases named as of minor interest are apple mildew and scab, apple and plum brown rot, and strawberry gray mold.

Summary report on the work of the botanical and mycological division [1916], T. PETCH (*Dept. Agr. Ceylon, Rpt. Dir.*, 1916, pp. 6, 7).—The outstanding feature of the year as regards disease of Hevea is said to have been the prevalence of pod disease and the consequent leaf fall caused by the same fungus and due to the continuance of the monsoon rains through August and September. *Ustilina zonata*, the cause of root disease, and *Kretzschmaria micropus*, found in old canker wounds on Hevea, also occur on old Hevea logs. Abandoned tea under rubber served as a starting point for *Fomes semitostus* (*F. lignosus*) or as a carrier for this fungus between rubber trees. Hevea stumps have proved to be centers for the dispersal of *U. zonata*, *F. semitostus*, and *Poria hypobrunnea*, as cacao stumps have served for the transmission of the first two of these fungi and for brown root disease. A disease of Hevea, known in Ceylon since 1905 and attributed to *P. vineta*, occurred during two years just prior to this report on Hevea and *Tephrosia candida* at Gangaruwa and on Hevea stumps near Peradeniya. Miscellaneous fungi which are named as found on Hevea during the year are *Ascochyta heveae* n. sp. and *Sphaerella heveae* n. sp. on Hevea leaves; and *Venturia emergens* n. sp., *Fracchiæa brevioribata*, *Phlyctæna heveae* n. sp., *F. depressa* n. sp., and *Haplosporcella crypta* n. sp. on Hevea branches.

A serious and apparently new disease of tea is caused by *Hypochnus* sp., which may prove to be identical with that producing the threads noted in connection with *Hemileia vastatrix* on coffee. A stem disease of tea is under investigation. *Nectria diversispora* has been obtained from the diseased tissue.

Miscellaneous fungi recorded during the year included *Oidium* sp., on egg plant; *Brysisphe polygonti* on *Pisum sativum*; *Colletotrichum orchidacearum* and *Fusarium* sp. on cultivated orchids; *Glæosporium musarum*, *Scolecotrichum musæ*, *Brachysporium torulosum*, *Macrophoma musæ*, and *Glomerella* sp. on plantains; *Melanconium* sp. on pomegranate; *Colletotrichum* sp. on *Crotalaria*; and *Tubercularia* sp. on roselle.

[Report on plant pathology], C. H. KNOWLES (*Fiji Dept. Agr. Ann. Rpt. 1916*, pp. 29-31).—The continued investigation of fungus diseases of plants (*E. S. R.*, 36, p. 347) is reported.

Leaf spots of *Hevea* were associated apparently with *Pestalozzia* sp., *Septoria* sp., *Colletotrichum* sp., or *Glæosporium* sp., and a disease of seeds and pods with *Sphaeronema album*. Leaves of a wild lemon from Suva showing yellowish spots yielded a fungus which may be *G. glæosporioides*. Peanuts at Nasinu showed a leaf spot ascribed to *Cercospora personata*. Members of the genus *Cercospora* appear on a number of plants in Fiji, including *Phaseolus mungo*, Giant cowpea, *Mikania scandens*, Mauritius beans, *Convolvulus* sp., and *Tacca pinnatifida*. The banana diseases previously noted (*E. S. R.*, 38, p. 651) are briefly described. *Dracena* leaves from the Rewa River showed a trouble producing dead tips, which is ascribed to a *Fusarium*. *Eucharis grandiflora* showing a leaf spot appeared to be attacked by a fungus of the group *Sphaeriaceæ*. *Durante* sp. showed a bark disease which apparently does no harm.

Diseases previously referred to but further observed during this year include coconut leaf spot (*Pestalozzia palmarum* and *Graphiola cocoina*). Date palm was attacked by *G. phænicis*, which has also been found on *Livistonia* sp. *Pestalozzia* sp. was found on the leaves of Para rubber in two places where it had appeared in previous years. *Glæosporium pestis* was found to attack the leaves of the more susceptible varieties of yams at Nasinu. *Hemelia vastatrix* is noted as still present at the Nasinu Station. *Pestalozzia* sp. was noted on *Kentia macarthurii* and *Colletotrichum* sp. on *Licuala grandis*.

Phytopathological notes, A. A. L. RUTGERS (*Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No. 4 (1917), pp. 25-29; Arch. Rubbercult. Nederland. Indië, 1 (1917), No. 4, pp. 313-317*).—In these notes the author discusses briefly information collected in 1916 and 1917 regarding insects of economic importance in connection with rubber and their control; such fungi as *Ustilina zonata*, *Poria* sp., *Phyllosticta heveæ*, *Cephaleuros virescens*, *Fomes* sp.; and injury from lightning.

Methods and formulas used in plant disease control, H. E. THOMAS (*Porto Rico Sta. Circ. 17 (1918), pp. 24-28*).—Brief accounts are given of various means of control of plant diseases, and formulas for the preparation of fungicides are presented.

The influence of X-rays on the development of the crown gall, I. LEVIN and M. LEVINE (*Proc. Soc. Expt. Biol. and Med., 15 (1917), No. 2, pp. 24, 25*).—Basing their work upon the facts that the main biological and therapeutic action of X-rays consists in inhibition of the proliferating capacity of young undifferentiated cells, and that crown gall (as well as cancer) is a new growth caused by continuous proliferation of a group of cells which normally do not proliferate, the authors studied the effect of X-rays on agar subcultures of *Bacterium tumefaciens* and on young *Ricinus* plants. Preliminary experiments having shown that with the technique employed normal plants are not disturbed by the influence of X-rays and that inoculations of *Ricinus* with *B. tumefaciens* are uniformly successful, the X-ray treatment was given to each plant six times at intervals of two days. Each of the control plants developed a large crown gall, the majority of the X-rayed plants developed no

growth, and only a slight swelling appeared at the point of inoculation. In ten cases there developed a small stunted growth.

A microscopic study of X-rayed galls is held to indicate that the main immediate action of the X-ray on the cells of the crown gall is not in the destruction of the cells directly but in the arrest of the proliferating process. It is thought that the rays inhibit the functions of the cells and do not destroy the bacteria. A fuller report of this study is to be given later.

Cereal diseases and the national food supply, H. B. HUMPHREY (*U. S. Dept. Agr. Yearbook 1917*, pp. 481-485, pls. 4).—Attention is called to the losses due to diseases of cereals, and suggestions are given for the elimination of a considerable amount of the damage caused by different species of fungi. The means suggested for reducing the losses are seed treatment, cultivation of resistant varieties, etc.

A third biologic form of *Puccinia graminis* on wheat, M. N. LEVINE and E. C. STAKMAN (*Jour. Agr. Research [U. S.]*, 18 (1918), No. 12, pp. 651-654).—During the progress of cooperative investigations between the Minnesota Experiment Station and the Bureau of Plant Industry, U. S. Department of Agriculture, the authors observed a form of *P. graminis* which attacks several species of wheat that have hitherto proved resistant to the ordinary forms of wheat rust.

Another strain of *Puccinia graminis*, L. E. MELCHERS and J. H. PARKER (*Kansas Sta. Circ. 68* (1918), pp. 4).—A biological form of *P. graminis* is described, for which the name *P. graminis tritici-inficiens* is proposed. This form has been found to attack readily three varieties of hard red winter wheat which have hitherto been resistant to the usual form of *P. graminis tritici* on wheat.

A bacterial disease of wheat in the Punjab, C. M. HUTCHINSON (*Mem. Dept. Agr. India, Bact. Ser.*, 1 (1917), No. 7, pp. 169-175, pls. 4).—A bacterial disease of wheat said to have been present for many years in the Punjab and under observation since 1908 is reported to have a low thermal death point and to be kept in check by this fact and by the dryness which is usually prevalent. A possible connection of the attack with nematode injury has been suggested. The name *Pseudomonas tritici* n. sp. is suggested in connection with the description which is given. Drainage and thorough cultivation are recommended as remedial measures.

Researches on disease resistance in red clover: Preliminary report, S. M. BAIN (*Trans. Tenn. Acad. Sci.*, 2 (1914-1917), p. 85).—It is stated that there is a great difference between the behavior of resistant and that of nonresistant strains of red clover toward anthracnose (*Colletotrichum trifolii*). Selections made at the Tennessee Experiment Station in 1905 have transmitted their resistant character to offspring under field conditions up to the time of this report. Results of preliminary studies indicate that this resistance is at least partly due to the chemical nature of the cell contents. Spores of the fungus placed in hanging drop cultures in contact with fresh sections of the stems showed very large differences in growth rate, amounting to as much as 300 per cent in an average of a series of cultures.

Report of the associate plant pathologist, C. D. SHERBAKOFF (*Florida Sta. Rpt. 1917*, pp. 76-86, figs. 6).—The investigations reported upon are mainly those of vegetable diseases, the work having been conducted as previously (E. S. R., 37, p. 651).

Additional information is given regarding the damping-off of vegetable seedlings due to *Rhizoctonia solani*. A breaking over of eggplant seedlings due to *Phomopsis* sp. is described, and it is stated that at least 25 per cent of the plants in one field were thus affected.

A bacterial spot of peppers is described at some length, the fruit, leaves, and stems being attacked. The disease is believed to be similar to, if not identical with, one previously described from Texas (E. S. R., 26, p. 645). An infection of pepper stems, to which the name pepper pink joint has been given, is briefly described, and, in attempts to isolate the organism causing the trouble, a fungus that could not be distinguished from *Sclerotinia libertiana* has been isolated. As yet no inoculations have been made to determine whether or not this organism is the cause of the disease.

Notes are given on a number of other diseases of more or less importance, together with suggestions for their control.

Experiments on the control of bean anthracnose and bean blight, J. H. MUNCE (*Michigan Sta. Tech. Bul.* 38 (1917), pp. 3-50, pls. 4).—After an account of anthracnose of bean due to *Colletotrichum lindemuthianum* and blight of bean due to *Bacterium phaseoli*, a report is given of experiments for the control of these diseases, including a bibliography of bean diseases.

Both diseases are said to be widespread and serious in Michigan and to be the cause of considerable loss in the crop. Both diseases are carried on the seed and may be carried from plant to plant in drops of water. The anthracnose is checked by high temperatures and by an absence of moisture, while the blight causes serious damage during dry seasons. Both organisms are said to overwinter in the soil or on diseased trash. Neither organism survives passage through the alimentary tract of cattle, but they may be carried to the field on diseased bean trash in manure.

In experiments for the control of these diseases, seed treatments with commercial solutions, as well as wet and dry heat, have failed to produce satisfactory results. Spraying, if the material is applied thoroughly and the applications are made soon enough, should control both the anthracnose and the blight. It is claimed that these diseases can be greatly reduced through the use of clean seed, such as can best be secured by pod selection or from Michigan seed grown for one year in California or Idaho, where the diseases do not exist.

Native western beans, it is said, can not be grown successfully in Michigan.

Sun scald of beans, H. G. MACMILLAN (*Jour. Agr. Research* [U. S.], 13 (1918), No. 12, pp. 647-650, pls. 3).—A description is given of a spotting and streaking of bean pods and stems in Colorado, the injury being attributed to sun scald. This investigation was carried on at the Colorado Experiment Station. While the pods are disfigured, no damaging effect has been observed due to scald. No variety of bean has been found to be immune to sun scald, when sufficiently exposed. It is stated that at certain stages of the disease, the appearance may be readily mistaken for bacterial infection, and can be differentiated from it only by microscopic examination.

Some bacterial diseases of lettuce, NELLIE A. BROWN (*Jour. Agr. Research* [U. S.], 13 (1918), No. 7, pp. 367-388, pls. 14).—This paper, which is a contribution from the Bureau of Plant Industry, of the U. S. Department of Agriculture, is designed to classify some of the common bacterial soft rots of lettuce, and it deals with four types of disease. Two of the diseases described were observed in 1916, one in South Carolina and Virginia and the other in Kansas, the latter occurring on greenhouse-grown plants. The South Carolina and Virginia disease is due to *Bacterium vitians* n. sp., while the one from Kansas is attributed to *B. marginale* n. sp. Technical descriptions of both organisms are given.

Recent progress in potato disease work in Maine, W. J. MORSE (*Agr. of Maine*, 1916, pp. 246-258).—The author discusses the work being done on potato diseases in Maine. The diseases dealt with include mosaic, net necrosis,

spindling sprout, Rhizoctonia stem injury or "little potato disease," blackleg of the potato, and powdery scab.

Influence of temperature and precipitation on the blackleg of potato, J. ROSENBAUM and G. B. RAMSEY (*Jour. Agr. Research* [U. S.], 13 (1918), No. 10, pp. 507-513, fig. 1).—The results are given of a cooperative investigation of the Bureau of Plant Industry, U. S. Department of Agriculture, and the Maine Experiment Station of the overwintering of the blackleg organism (*Bacillus phytophthorus*) in the soil and of the relation of temperature and precipitation to the severity of the disease.

Badly diseased tubers were placed in the soil in the fall and allowed to remain there during the winter. The following spring, selected tubers were planted in the same rows where the diseased potatoes had passed the winter. No evidence could be obtained to indicate that the blackleg organism, under the winter conditions existing in Aroostook County, Me., during 1915-16 and 1916-17, or at Norfolk, Va., during 1916-17, can live over in the soil or in diseased tubers that may remain there. The severity of the disease during the growing season is said to be closely correlated with temperature and precipitation and is dependent upon them. High temperature and low precipitation tend to diminish the disease, while low temperature and high precipitation produce conditions favorable to it.

Pox, or pit (soil rot), of the sweet potato, J. J. TAUBENHAUS (*Jour. Agr. Research* [U. S.], 13 (1918), No. 9, pp. 437-450, pls. 2).—In a contribution from the Texas Experiment Station, the author describes pot or pit, of the sweet potato, a disease he has had under investigation for a considerable time at the Delaware and Texas Experiment Stations. This disease, which has been shown by Elliott to be due to *Cystospora batata* (E. S. R., 36, p. 544), is said to be of economic importance and to be widely distributed.

So far as investigations have indicated, the infection seems to be confined to attacks in the field, little or no injury being reported in storage from this organism. In addition to the sweet potato, the Irish potato and turnip are known to be attacked, and the beet and tomato are suspected of being susceptible hosts. The organism is believed to hibernate as cysts in the soil. Associated with the organism causing pox, *Actinomyces poolensis* n. sp. has been found as a wound parasite. The red varieties of the sweet potato are said to possess considerable resistance to pox. Rotation of crops seems to offer the best means of control.

Effects of various salts, acids, germicides, etc., upon the infectivity of the virus causing the mosaic disease of tobacco, H. A. ALLARD (*Jour. Agr. Research* [U. S.], 13 (1918), No. 12, pp. 619-637).—An account is given of experiments carried on in the Bureau of Plant Industry of the U. S. Department of Agriculture to determine the effects of different concentrations of salts, acids, alkalis, germicides, etc., upon the infectivity of the virus which causes the mosaic disease of tobacco. In all about 30 chemicals were used, many of them proving to be without effect. Mixed with talc, kaolin, or soil, the virus was found frequently to lose its infectious properties more quickly than when bottled without the addition of any preservative.

Inoculation experiments with species of *Coccomyces* from stone fruits, G. W. KERR (*Jour. Agr. Research* [U. S.], 13 (1918), No. 11, pp. 539-569, pls. 5, figs. 3).—Results are given of an investigation carried on at the Wisconsin Experiment Station, in which more than 1,000 cross-inoculation tests were made with *Coccomyces* spp. from the more common species of *Prunus*, to determine the possibility of the wild species acting as hosts to the organism.

It is believed to be indicated, though not conclusively, that in Wisconsin no serious infection of cultivated cherries is induced by the presence of wild

hosts, with the possible exception of *P. pennsylvanica*. However, the native *P. americana* may act as a harbinger of infectious material for cultivated plums.

Spraying to control anthracnose on black raspberries, W. C. DUTTON (*Michigan Sta. Spec. Bul.* 88 (1918), pp. 8, figs. 8).—Spraying experiments for the control of anthracnose of black raspberries due to *Plectodiscella veneta* were conducted in 1914 and 1915 with lime-sulphur, soluble sulphur, copper sulphate solution, and Bordeaux mixture, the most efficient control being obtained where lime-sulphur was used. Experiments were repeated in 1917, lime-sulphur being the only fungicide used, and three applications were found to give satisfactory results. To insure success in the application of this fungicide, the author states that the applications should be made as follows: The first in the spring before growth starts, the second when the shoots are 6 to 8 in. high, and the third just before the plants are in bloom.

[Treatments for grape diseases], E. ZACHAREWICZ (*Rap. Trav. Dir. Serv. Agr. [Dept. Vaucluse, France]*, 1915-16, pp. 180a-186a).—Treatment for grape downy mildew, Oïdium, and anthracnose are given with brief discussion.

False black rot in Var, G. ARNAUD (*Rev. Vit.*, 47 (1917), No. 1223, pp. 357-360, figs. 3).—It is stated that what has been thought to be black rot (*Guignardia bidwellii*) in the Province of Var, France, is really false black rot (*G. baccae*), the former disease being supposedly excluded from that region by adverse climatic conditions.

Diseases of the olive, L. PETRI (*Le Malattie dell' Olivo. Florence: Ist. Microg. Ital.*, 1915, pp. V+169, pls. 21, figs. 20).—This manual for the identification of parasitic and nonparasitic diseases of the olive, with particular regard to combating parasitic diseases, is in three parts, the main portion dealing with parasites in relation to their hosts.

The banana disease and its control (*Sec. Agr. Com. y Trab., Com. Sanid. Veg. Cuba, Bul.* 1 (1917), pp. 80, 81, pls. 6).—The Panama disease is said to cause heavy losses to banana growers in western Cuba. The causal organism appears to be a fungus readily carried in the soil or on shoes, tools, root stalks, or suckers. Methods of control as outlined are based upon rigid sanitation and the use of disease-resistant varieties.

Report of the plant pathologist, H. E. STEVENS (*Florida Sta. Rpt.* 1917, pp. 66-75, fig. 1).—The investigations reported were conducted upon lines similar to those previously noted (*E. S. R.*, 37, p. 656), and include studies of citrus diseases.

Certain species of fungi are reported as being associated with gummosis, and inoculation experiments were made with fragments of diseased bark without definite results. Some studies were made of the associated organisms, and it is believed that *Phomopsis*, *Diplodia*, and probably other species of fungi have only a secondary rôle, in that they are responsible for the gradual enlargement and aggravated condition of gummosis areas.

Some additional notes are given on the effect of pruning for the control of melanose, and, while it was not found possible to check the disease completely, careful pruning resulted in the production of a much larger percentage of desirable fruit.

Additional studies on the vitality of the citrus canker organism in the soil are reported. It was found that the organism can propagate and remain alive and virulent for a period of 26 months. It is believed that the organism is capable of surviving long periods of desiccation without complete loss of vitality and with little apparent loss of virulence.

A brief account is given of a study of a gumming of citrus trees previously reported as due to a fungus resembling *Pythiacystis citrophthora* (*E. S. R.*, 37, p. 656). Later studies, however, have shown that *Phytophthora terrestris*,

reported as causing buckeye rot of tomatoes (E. S. R., 38, p. 251), attacks citrus trees, producing foot rot. A further comparative study of these two organisms has led to the conclusion that they are identical, and the fungus will be considered in the future as *Phytophthora terrestris*. This organism has been repeatedly found in cultures taken from widely separated areas in the State, indicating a general distribution of the organism. Experiments are in progress to determine the true relationship of the fungus to its host and its manner of attack.

Notes are given on several miscellaneous diseases of citrus trees, among them a new fruit spot injury of grapefruit in which spots appear that are dark brown to nearly black, with a smooth, hard, glazed surface. The injury seems to be confined to the rind tissue, and decay of the fruit does not seem to result. The cause of the spotting has not yet been determined.

Injury to citrus trees by the improper use of ground limestone, B. F. FLOYD (*Florida Sta. Rpt. 1917, pp. 35-46*).—In a previous publication (E. S. R., 37, p. 656), the author reported injury to citrus trees due to the use of ground limestone. Additional experiments have been conducted which indicate that grapefruit seedlings show a distinct injury from the presence of ground limestone in the soil, as shown by the yellowing of the foliage. Two types of yellowing characterize the injury, (1) a lack of green color in the area between the largest veins and (2) a chlorosis which consists of a more or less complete yellowing or whitening of the leaves. Both forms of injury are said to have a quantitative relation to the limestone in the soil, the largest amount occurring in plants on soils having the largest percentage of limestone.

Somewhat similar injury is reported as due to ammonia added to the soil, cottonseed meal being favorable to the production of complete chlorosis in sandy soils containing limestone, while sulphate of ammonia, to a limited extent, acted as an inhibiting factor to the development of the disease. More injury was induced by the limestone in sandy soils than by that in loam soils.

Additional observations on the citrus fruits in the Philippines, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 2, pp. 104-115, pls. 7*).—Referring to the citrus canker in the Philippines (E. S. R., 36, p. 851), the author states that the virulence of the disease is periodic. Tables are given showing the degree of severity of attacks of citrus canker on different varieties.

Notes on citrus canker affection at the Lamao Experiment Station, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 3, pp. 253-260*).—Presenting tabulated results of a continued series of observations in pursuance of those noted above, the author calls attention to the behavior of citrus varieties showing a tendency toward immunity.

Effects of formalin-Bordeaux mixture on citrus canker, E. D. DORYLAND (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 1, pp. 51-54*).—In continuation of work previously noted (E. S. R., 36, p. 850), experimentation of more extensive scope at the Lamao Station resulted in what is thought to be an effective remedy for citrus canker. The formalin-Bordeaux spray is said to have proved satisfactory on small, badly infected areas. Whatever reinfection was noticed was apparently due to the disease having been carried over from outside sources. Spraying experiments carried on during the wet season in 1916 gave somewhat the same results as were obtained during the dry period of the year.

Investigation of diseases and pests of coconut palms, D. B. MACKIE (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 2, pp. 130-134, pls. 2*).—Noting the results of inspection for diseases and pests of the coconut palm, particularly bud

rot, the author discusses briefly the distribution and prevalence of bud rot, effect of meteorological conditions, and the pathogenic agent, which is still under investigation.

The bud rot of the coconut and its control (*Sec. Agr. Com. y Trab., Com. Sanid. Veg. Cuba, Bul. 1 (1917), pp. 78, 79, pls. 2*).—Coconut bud rot is said to have caused enormous losses to those engaged in the coconut industry in Cuba. As a means of control severe flaming with a torch or destroying in the beginning of the attack all trees showing signs of the disease is recommended.

Report of laboratory assistant in plant pathology, J. MATZ (*Florida Sta. Rpt. 1917, pp. 87-94, figs. 7*).—Additional information is given regarding the pecan dieback previously reported as due to *Botryosphaeria berengeriana* (E. S. R., 37, p. 652). Inoculation experiments with this organism and *Dothiorella gregaria* from walnut in California have shown remarkable resemblances, if not the identity of the two organisms.

A pecan leaf disease due to a new species of *Gnomonia* is described at some length. This organism causes irregular spots on the leaves. Inoculation experiments have been carried on in which an organism resembling that used in the experiment has been reisolated.

Pecan scab (*Fusicladium effusum*). Pecan diseases other than scab, C. S. SPOONER and C. G. CRITTENDEN (*Ga. Bd. Ent. Bul. 49 (1918), pp. 38-48, pls. 4*).—The authors discuss briefly pecan scab, which is said to be the most serious disease of pecans, pecan rosette, brown leaf spot, kernel spot, nursery blight, anthracnose, crown gall, and mildew, and give recommendations for their control.

A fungus attack on the deodar, H. M. GLOVER (*Indian Forester, 43 (1917), No. 11-12, pp. 498, 499, pl. 1*).—A root fungus, not yet identified, is said to have caused injury to young deodar under regeneration in the drier regions of the Bashahr Division. The plants grown in the shade were the first to succumb to the disease, which attacks the tree through its roots. The appearance and progress of the disease are briefly discussed. Seedlings and saplings are usually killed outright, but they may recover from the attack and remain healthy. Cutting out diseased specimens has not been satisfactory as a means of eradication.

Hevea bark disease, T. PETCH (*Trop. Agr. [Ceylon], 50 (1918), No. 1, pp. 14-17*).—In an address delivered before the Haputale Planters' Association, the author states that diseases of Hevea have formerly not been so prominent on this side as on the western side of the island. The principal troubles have been brown root disease, that due to *Fomes semitostus*, and the nodule disease, but this apparent immunity of Hevea appears to be rapidly disappearing. A new disease is noted and discussed as bark canker, which appears to be confined to districts depending solely or chiefly on the northeast monsoon. It may be confused with the early stages of nodule formation and may be favored by the periodical scraping of the trees which is now customary in that region.

Notes on bark cankers and their treatment, W. N. C. BELGRAVE and F. DE LA M. NOBBS (*Agr. Bul. Fed. Malay States, 6 (1917), No. 1, pp. 2-10*).—These notes consider briefly the claret-colored bark canker or patch canker (possibly *Phytophthora faberi*), black-stripe canker (*Phytophthora* sp.), moldy rot of recently tapped surfaces, and water-logged bark.

Abnormal leaf fall of Hevea rubber, W. McRAE and R. D. ANSTEAD (*Planters' Chron., 13 (1918), No. 3, pp. 38-40*).—Previous work (E. S. R., 38, p. 456) has been followed up with tests carried out on four areas ranging from 30 to 105 acres. All dead branches were cut out, large wounds smoothed and

tarred, old fruit pods removed with their stalks, all leaves, fruit, twigs, and branches on the ground removed and destroyed, and as many as possible of the new pods removed before June 10 so as to get rid of all seed pods. The disease attacks primarily the fruit and spreads to the leaves, branches, and bark, so that trees carrying much fruit are severely attacked and those having little fruit but slightly.

The expense and difficulty of removing all fruit are considerable. Weeding and manuring are mentioned as helpful. Measures must be thoroughly carried out to be profitable.

A preliminary note on "brown bast," W. N. C. BELGRAVE (*Agr. Bul. Fed. Malay States*, 6 (1917), No. 1, p. 1).—A fungus occurring in the bark of Hevea trees suffering from brown bast or water-logged bark and thought to be a *Spongospora* is said to require further study.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Revision of the American flying squirrels, A. H. HOWELL (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna* No. 44 (1918), pp. 64, pls. 7, figs. 4).—A revision of the numerous forms of American flying squirrels which comprise two distinct groups. (1) *Glaucomys volans*, the small species of eastern United States and Mexico, and (2) *G. sabrinus*, the larger species occupying western United States and Canada, with one form ranging into New England and the border States along the Great Lakes. The food habits of the flying squirrels are said to be such that they are almost entirely harmless.

Cooperative campaigns for the control of ground squirrels, prairie dogs, and jack rabbits, W. B. BELL (*U. S. Dept. Agr. Yearbook* 1917, pp. 225-233, pls. 3).—A brief account of cooperative campaigns.

Rodent pests of the farm, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul.* 932 (1918), pp. 23, figs. 16).—A popular summary of information on rodent pests and means for their control.

The house rat: The most destructive animal in the world, D. E. LANTZ (*U. S. Dept. Agr. Yearbook* 1917, pp. 235-251, pls. 4).—This article calls attention to the great loss caused by the house rat and discusses control measures, including building regulations needed in cities and special precautions required in seaports.

A fungus disease of mice, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales*, 29 (1918), No. 2, pp. 131, 132, fig. 1).—The decrease in the mouse plague in Australia is thought to have been partly due to favus, caused by *Achorion schönleini*.

The Great Plains waterfowl breeding grounds and their protection, H. C. OBERHOLSER (*U. S. Dept. Agr. Yearbook* 1917, pp. 197-204, pls. 2).—A descriptive account.

[Insectivorous birds of Louisiana], H. H. KOPMAN (*Mod. Farming*, 47 (1917), Nos. 14, pp. 2, 3; 16, pp. 2, 3; 17, pp. 2-4; 18, pp. 2, 3, figs. 14).

Homing and related activities of birds, J. B. WATSON and K. S. LASHLEY (*Carnegie Inst. Washington Pub.* 211 (1915), pp. 5-104, pls. 7, figs. 10).—An account is first given by the authors on A Historical and Experimental Study of Homing (pp. 7-60), followed by Notes on the Nesting Activities of the Noddy and Sooty Terns, by K. S. Lashley (pp. 61-83) and Studies on the Spectral Sensitivity of Birds, by J. B. Watson (pp. 85-104).

The duck sickness in Utah, A. WETMORE (*U. S. Dept. Agr. Bul.* 672 (1918), pp. 25, pls. 4).—This is the final report on investigations during 1915 and 1916 of mortality among ducks and other waterfowl in marshes about Great Salt

Lake, Utah, on which a bulletin relating particularly to 1915 has been previously noted (E. S. R., 33, p. 251). The information is intended particularly for sportsmen and others interested in the conservation of game birds.

It has been definitely established that the duck sickness in Utah is caused by the toxic action of certain soluble salts found in alkalis. As in the previous report it is pointed out that birds slightly affected and even many entirely helpless recover in almost all cases when given plenty of moderately fresh water. Of about 1,000 banded recovered ducks released, returns have come in from about 170, several from as far distant as the Pacific Ocean in California, south to the Mexican border in New Mexico, east to Joplin, Mo., and north into Saskatchewan in Canada, which indicate the permanency of the cure and subsequent longevity of the individual that has recovered.

[Economic insects in California and control measures] (*Mo. Bul. Cal. Com. Hort.*, 6 (1917), Nos. 11-12, pp. 432, 435-437, 441, 442, 453, 454, 457, 458, 463-467, 471, 473, 474, 475-479, figs. 8).—The papers here presented relating to insects of economic importance in California are as follows: The Mealy Bug Problem of Grapes, by F. K. Howard (p. 432); Forced Control of Insect Pests in Los Angeles County, by W. Wood (pp. 435, 436); Inspection at Point of Origin, by G. Marchbank (p. 437); Common Pests Prevalent in Modoc County, by T. Briles (pp. 441, 442); Spraying as a Means of Controlling Black Scale on Citrus Trees, by J. P. Coy (pp. 453, 454); Fruit Inspection in the San Francisco Markets, D. Moulton (p. 457); Fall Work in Insect Control, by H. H. Ladd (p. 458); The Apple Leaf-mining Case Bearer (*Coleophora volckei* n. sp.), by W. H. Volck (pp. 463-467) (E. S. R., 38, p. 862); Tobacco Treatment of Aphids, by O. E. Bremner (p. 471); Thirty Years with Red Spider, by H. P. Stabler (pp. 473, 474); Control of Citricola Scale in Tulare County, by C. F. Collins (pp. 475-477); and The Control of Walnut Aphis (*Chromaphis juglandicola*), by A. A. Brock (pp. 478, 479).

Report of entomologist, J. R. WATSON (*Florida Sta. Rpt. 1917*, pp. 52-65, fig. 1).—Mention is first made of studies of the velvet bean caterpillar (*Anticarsia gemmatilis*) and the control of nematodes, bulletins relating to which have been previously noted (E. S. R., 35, p. 854; 37, p. 453). Mention is then made of two beneficial insects imported from California, namely the Sicilian mealy bug parasite (*Paraleptomastix abnormis*) and the ladybird beetle (*Delphastus catalinæ*).

In a brief consideration of the insects of the year mention is made of the green soldier bug (*Nezara viridula*) and other plant bugs, which were unusually abundant on citrus and potatoes; the pecan twig girdler (*Oncideres cingulata*) which was found girdling *Eucalyptus rostrata* at Tigerbay; the sweet potato root weevil (*Cylas formicarius*) received from Baker County where the infestation was severe; the fowl tick (*Argas miniatus*) which was a source of loss in Seminole County; etc.

(Controlling insects and other pests in Porto Rico), R. H. VAN ZWALUWENBURG and H. E. THOMAS (*Porto Rico Sta. Circ. 17* (1918), pp. 3-23, 29, 30).—This is a summary of information on insecticides and means of controlling crabs and rats.

Report of the Government entomologist, C. MASON (*Nyasaland Dept. Agr. Ann. Rpt. 1917*, pp. 9-13).—This report deals with the occurrence of and work with the more important insects of the year, particularly those affecting cotton.

Physical properties governing the efficacy of contact insecticides, W. MOORE and S. A. GRAHAM (*Jour. Agr. Research* [U. S.], 13 (1918), No. 11, pp. 523-538, fig. 1).—Studies at the Minnesota Experiment Station are reported.

"From the general results reported in this paper it appears that the physical properties as well as the chemical properties have an important bearing upon

the efficiency of the contact spray. Even though the spray may contain a very active poison it will not be effective unless it conforms to certain physical requirements—that is, the ability to vaporize and penetrate in the form of a vapor or to spread over the insect and penetrate in the liquid form. The results reported by McClintock, Houghton, and Hamilton¹ show very clearly that this is true. The results in the use of quassia with or without soap as reported by McIndoo and Sievers [E. S. R., 38, p. 55] are another example, and it is a common observation that the addition of soap to nicotin sprays increases their efficiency. The following are some of the principles which must be kept in mind in studying the effects of contact insecticides:

“(1) Contact insecticides may be divided into two groups: (a) Those which spread over the body of the insect and penetrate the tracheæ. (b) Those which are not able to spread over the insect and do not penetrate the tracheæ. (2) Contact insecticides which are either soluble in ether or chloroform or are fat solvents are able to spread over the insect and enter the tracheæ. (3) The rate of spread of these insecticides is governed by their viscosity and cohesion. (4) Compounds with a viscosity as high or higher than castor oil spread so slowly that in general they may be classed as poor insecticides. (5) Compounds more volatile than xylene evaporate too quickly for effective work. (6) Sprays in the form of emulsions may enter the tracheæ as such, or the oil remaining after the emulsion is broken down may spread over the insect and enter the spiracles. (7) Relatively nonvolatile oils penetrate the body of the insect directly through the walls of the tracheæ as liquids, the rate depending upon the viscosity. (8) Volatile oils may penetrate the walls of the tracheæ in either vapor or liquid form. (9) Sprays which are unable to enter the tracheæ in liquid form may penetrate and pass through the tracheal walls as vapor. (10) Fumigants gain entrance and pass through the tracheal walls in vapor form. (11) Slightly volatile compounds tend to condense upon the tracheal walls, owing to the fact that small quantities are sufficient to saturate the atmosphere. Owing to this high saturation these condensations tend to penetrate the chitin rather than to reevaporate. Volatility is an index of the ability of the compound to gain entrance into the insect and is therefore closely correlated with toxicity.”

A bibliography of 21 titles is included.

A promising new contact insecticide, W. MOORE (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 341, 342).—The author's investigations have led to the preparation of nicotin oleate, a new contact insecticide made by the formation of a soap or soap-like salt by the union of nicotin and oleic acid. It dissolves in soft water, forming a soapy solution which may be used to emulsify an animal, vegetable, or mineral oil. Comparisons of its killing power made with other contact insecticides show it to be very effective and to be much cheaper than the free nicotin sprays. It is stated that nicotin oleate will cost the farmer about \$1 a hundred gallons, where the free nicotin spray will cost \$2.20 for the same amount.

“To make the oil emulsion spray with nicotin oleate, 10 parts of kerosene is mixed with 1.25 parts of commercial oleic acid and then 2.5 parts of 40 per cent nicotin solution is added and thoroughly shaken. Ten parts of water is then added and again thoroughly shaken. For use against mealy bugs, white fly, and soft scale this quantity it then mixed with 480 parts of soft water.”

The selection of petroleum insecticides, R. K. VICKERY (*Mo. Bul. Cal. Com. Hort.*, 6 (1917), No. 10, pp. 384-387).—A brief discussion.

¹ Rpt. Mich. Acad. Sci., 10 (1907), pp. 197-208.

Fumigation experiments.—The time factor, A. F. SWAIN (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 326-324).—"From a series of 44 experiments (using a total of 7,485 insects) carried on in the daytime under form 'trees' covered with tents of 8 oz. U. S. Army duck, with both coccinellid beetles (*Hippodamia convergens*) and red scale (*Chrysomphalus aurantii*), it was shown that an exposure of hydrocyanic acid gas for 30 minutes was not sufficient to obtain the highest killing efficiency. It was shown, however, that with 45 minutes as good results were obtained as with 60 and 90 minutes. From an examination of the results of commercial fumigation against the citricola scale (*Coccus citricola*) in 125 groves in Tulare County during the 1917 season, it was learned that there was no practical difference between the killing efficiency of the hydrocyanic acid gas with exposures of 45, 50, and 55 minutes.

"It may be concluded from these experiments that an exposure of 45 minutes is sufficient to kill the red scale, under the conditions as given. It is possible that with fumigation carried on at night, where the temperature is lower and the tent leakage possibly less, that a longer period may be somewhat more efficient. However, from the data given for the citricola scale, it appears that under normal conditions for commercial fumigation a 45-minute exposure is fully as efficient as a 50- or 55-minute exposure."

Cyanid fumigation.—Diffusion of gas under tent and shape of tree in relation to dosage, H. J. QUAYLE (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 294-299, pl. 1, fig. 1).—"The greatest concentration of hydrocyanic acid gas occurs in the upper half of tented trees. The difference in the effect on insects at the top and bottom of a tree may be great enough to impair the results seriously. Little difference in gas concentration has been indicated by our experiments between the top and center of the tree. Better killing of insects was secured in the low tent (22 by 44 ft.) than in the high tent (31 by 31 ft.). The actual difference was 19.4 per cent. These tents represent the most extreme shapes in citrus trees. Proportionally there is more tent surface, and also volume, in a tall tree than a broad tree, and this is not indicated by the tape measurement around the tree, or by considering the tree as a fixed geometrical figure. For practical consideration, the tall tree may well show more or less injury at the top to insure the insects being killed at the bottom."

Removing insects from greenhouse plants without spraying and without injury to the plants, P. EMERSON and J. B. S. NORTON (*Science*, n. ser., 47 (1918), No. 1202, p. 44).—A brief description is given of an apparatus used, which works on the principle of a vacuum cleaner.

A list of the insects affecting sugar cane in British Guiana, H. W. B. MOORE (*Timeltri, Brit. Guiana*, 3. ser., 3 (1915), No. 2, pp. 305-310).—An annotated list of 46 species, in which reference is made to the nature of their injury and natural enemies.

Some problems in the control of insects in stored foods in California, R. W. DOANE (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 313-320).—This discussion is based upon a survey made by the author of about 100 warehouses and flour mills in central and southern California while acting as consulting entomologist for the Federal Food Commission of California.

The Mediterranean flour moth was found to be the most serious pest in warehouses, being found in nearly all the flour mills, and in several instances hundreds of sacks of flour were covered with the fine webs spun by the larvæ. In one warehouse nearly 1,000 sacks were thus seriously infested and about 2,000 other sacks showed only lighter infestation. The rice weevil was found in great numbers in some warehouses and was present in smaller numbers in many other places. The granary weevil was found in probably half of the

warehouses visited, but usually only in small numbers. It was found, however, in some instances in association with the saw-toothed grain beetle and at times both became very abundant and destructive. The confused flour beetle (*Tribolium confusum*) was found in nearly all warehouses and in some of the mills. The rust-red flour beetle (*T. navale*) was also found in a few places. A few other moths and beetles, some of them as yet unidentified, and a mite, probably *Tyroglyphus longior*, were found in various cereals and cereal products in mills and warehouses, stores, and private houses.

Report on Arachnida collected by Messrs. Currie, Caudell, and Byar in British Columbia, N. BANKS (*Proc. U. S. Nat. Mus.*, 51 (1917), pp. 67-72).

The European earwig, *Forficula auricularia*, E. O. ESSIG (*Jour. Econ. Ent.*, 11 (1918), No. 3, p. 338, pl. 1).—Attention is called to the occurrence of this earwig at Seattle, Wash. See also a previous note by Jones (*E. S. R.*, 38, p. 56).

Nysius ericae, the false chinch bug, F. B. MILLIKEN (*Jour. Agr. Research* [U. S.], 13 (1918), No. 11, pp. 571-578, pls. 2, fig. 1).—This is a report of biological studies of *N. ericae* (*angustatus*) made at Garden City, Kans., by the Bureau of Entomology, U. S. Department of Agriculture, during 1913, 1914, and 1916. This insect has been recognized for many years as a serious pest, particularly in the semiarid regions of the United States, where it causes great damage to sugar beets and cruciferous garden crops by settling on them in such numbers as to cause them to wilt in one or two days.

Technical descriptions are given of its several stages. Its life cycle at Garden City during 1914, at an average temperature of 79.78° F., was as follows: Egg stage 4 days, five nymphal stages 20.35, maturity to mating 3, mating to oviposition 1, and beginning of oviposition to death 12, with a total of 40.35 days. The author regards it as conclusive that five generations matured at Garden City during 1913 after June 1. To the minimum of five generations, an overwintering generation and a possible generation in the spring may be added, making seven in all.

Notes on the beet leafhopper, *Eutettix tenella*, H. H. P. SEVERIN and W. W. THOMAS (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 308-312).—"In the cultivated districts of the Imperial Valley, Cal., *E. tenella* has been found in large numbers on the Australian saltbush (*Atriplex semibaccata*) in January and March, and the lowland or sea purslane (*Sesuvium sessile*) in March. The pest is breeding on these two plants under natural conditions. No complete hibernation occurs in the Imperial Valley."

Alternation of hosts in economic aphids, W. M. DAVIDSON (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 289-294).—A brief discussion of this subject, together with a bibliography of papers dealing with the alternate host habits of the beet aphid (*Pemphigus betæ*), the apple and pear woolly aphids (*Eriosoma lanigerum* and *E. pyricolium*), hop aphid, clover aphid (*Aphis bakeri*), potato aphid (*Macrosiphum solanifolii*), English grain aphid (*M. granarium*), oat aphid (*A. prunifolia*), southern plum aphid (*A. setariae*), green peach aphid, currant aphid, rosy apple aphid (*A. malifoliae*), cherry aphid, and grapevine aphid (*M. illinoense*).

Observations on a fungus enemy of the walnut aphid in southern California, O. F. BURGER and A. F. SWAIN (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 278-289, pl. 1, figs. 3).—The authors report that in the spring of 1917 the walnut groves of southern California were heavily infested by the walnut aphid (*Chromaphis juglandicola*). "Although a period of extreme heat in June and the presence of numerous insect enemies throughout the season were responsible for the death of a large percentage of these aphids, it was noted that a fungus also contributed to their mortality. Before the period of extreme heat, in El Monte, as high as 88 per cent were killed by this fungus (*Entomophthora*).

chromaphidis n. sp.). Some time after this period of extreme heat, the aphids increased rapidly but under the conditions noted were effectively controlled by this fungus."

Aphis bakeri and some allied species, C. P. GILLETTE and L. C. BRAGG (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 328-333, figs. 2).—The authors present a key to and notes on the several closely allied species that are grouped around *A. bakeri*, five in number, including *A. sensoriata* n. sp., collected on *Amelanchier* sp., at Log Cabin and Fort Lewis, Colo.

The dormant spray for the San José scale, G. G. BECKER (*Arkansas Sta. Bul.* 141 (1918), pp. 3-11).—This is a discussion of the preparation and use of lime-sulphur, especially from an economic standpoint.

Destruction of Diaspis by Prospaltella, F. A. BARROETAVERÑA and C. D. GIROLA (*Destrucción de la Diaspis por la Prospaltella. Buenos Aires: Min. Agr. Nac.*, 1915, pt. 1, pp. 24, pl. 1; 1916, pts. 2, pp. 32, pls. 3; 3, pp. 39, pls. 3, figs. 8).—These reports relate to the work with this parasite (*P. berlessei*) of the West Indian peach scale in Argentina.

A new bacterial disease of gipsy moth caterpillars, R. W. GLASER (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 10, pp. 515-522, pl. 1).—This is a report of studies by the Bureau of Entomology, U. S. Department of Agriculture, of a new infectious disease of the gipsy moth found in cultures of the Japanese race of the gipsy moth reared in the summer of 1915 from eggs obtained from Ogi, Japan. The infection, which spread later to cultures of the American race, causes a disease clinically, pathologically, and etiologically distinct from wilt. The studies have shown that the affection is due to a new species of streptococcus, which is here described as *Streptococcus disparis*.

During the early stages of the disease the bacterium is found throughout the alimentary tract of the gipsy moth caterpillars, but during the later stages, and after death, it invades practically all the tissues. The organism gains entrance to the alimentary tract in the ingested food, healthy individuals becoming infected by eating food soiled by the feces of those infected. It is not pathogenic to the silkworm or the army worm, nor to human beings, guinea pigs, or rabbits. The most striking pathological changes during the course of the disease occur in the muscle tissues of the caterpillar.

Many observations and tests show that the new disease did not occur in this country prior to 1917. In field experiments conducted with *S. disparis* in sections of the gipsy moth infested territory, success was met with many times in reproducing the disease in the field, in two places quite a severe epidemic being created.

Descriptions of new Lepidoptera from Mexico, H. G. DYAR (*Proc. U. S. Nat. Mus.*, 51 (1917), pp. 1-87).—Seven genera are erected and 110 species and 3 subspecies described as new.

The pink bollworm problem in the United States, W. D. HUNTER (*Quart. Bul. Plant Bd. Fla.*, 2 (1918), No. 3, pp. 139-149, figs. 5).—This is a survey of the present status of the pink bollworm, including an account of its accidental introduction into the United States and of eradication and control work now under way.

It is shown that the pink bollworm was probably introduced into Mexico in Egyptian cotton seed imported in 1911, in which year 125 sacks of seed were planted in the immediate vicinity of Monterey. As a consequence of a large first crop much of the seed produced was shipped for planting to the Laguna region, where the bulk of Mexican cotton is produced, and in this way the pink bollworm was spread in a very short time over a large territory in Mexico. Practically all of the plantations in the Laguna are now infested, some showing a falling off in the crop of 1917 of from 50 to 75 per cent. The shipping of seed

from the Laguna for planting purposes resulted in two other infestations in Mexico, one near Allende, about 40 miles south of Eagle Pass, and the other immediately opposite Del Rio, Tex.

The presence of the pest in Mexico was first determined by the Bureau of Entomology of the U. S. Department of Agriculture early in November, 1916, through the identification of specimens received from the Laguna. The further importation of cotton seed was at once prohibited and every attempt made to remove the danger of the infestation of the Texas fields through the arrival of seed previously shipped. During 1917 scout work carried on in the vicinity of mills which received the Mexican seed resulted in the discovery of an infested field in the vicinity of the mill at Hearne, Robertson County, and a month later at Beaumont, Jefferson County, Tex., where 114 carloads of seed had been received.

Eradication work in these localities was undertaken immediately and the cotton plants on an area of over 7,000 acres were uprooted or chopped down and burned with the aid of oil, at an average cost of \$10.72 per acre.

Shortly after the discovery of the pest in Jefferson County, it was discovered at Anahuac, Chambers County, and later investigations showed it to occur around Trinity Bay, extending as far as Galveston County. It now appears that the origin of this infestation bordering on Galveston Bay was in the considerable number of bales of Mexican cotton washed ashore in the great storm of August, 1915.

The work against the pink bollworm includes the exclusion from the United States of cotton seed from all foreign countries, the fumigation of all bales of foreign cotton arriving at the United States in vacuum chambers under Federal supervision, the regulation of the traffic from Mexico which includes the interior fumigation and the exterior spraying of all cars, the eradication of the insect in Texas in cooperation with the State department of agriculture under a special law provided by the legislature, which includes the operation of three cotton-free zones of considerable size, and work in Mexico looking toward the eradication of the insect in that country to eliminate the possibility of further infestation of the United States from that source. The cotton-free zones include one at Hearne consisting of a circular area with a radius of 2.5 miles about the only fields which were found infested; the second in southeastern Texas, extending from Jefferson County on the east to include a portion of Fort Bend County on the west, which is by far the largest and most important of the cotton-free zones provided, and the third consists of three counties on the Rio Grande, opposite the infestation found in northern Mexico.

Notes on an insect pest of potatoes, M. CASORIA (*Bul. Union Agr. Égypte*, 15 (1917), No. 120, pp. 77-81; *abs. in Rev. Appl. Ent.*, Ser. A, 5 (1917), No. 11, p. 489).—The pyralid *Eusophra osseatella*, which occurs in Egypt usually on the stalk of the eggplant, was found early in 1917 to attack the potato plant and cause a sudden wilting of the plants. The larvæ perforate the stem at the level of the soil and bore upward for about an inch. Pulling up and burning the infested plants appears to be the only remedy.

Tortrix investigation, N. K. JARDINE (*Trop. Agr. [Ceylon]*, 49 (1917), No. 4, pp. 228, 229).—These notes relate to the occurrence of *Phytodietus capua* on the estates examined and observations of its natural enemies.

[The occurrence and oviposition of Tortrix pronubana in London district], H. D. SMART (*Entomologist*, 50 (1917), No. 655, pp. 279, 280).—The occurrence of all stages of this lepidopteran on Euonymus and privet bushes and observations on its oviposition are recorded.

The effects of petroleum oils on mosquito larvæ, S. B. FREEBORN and R. F. ATSATT (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 299-308).—"The toxicity of the

petroleum oils as mosquito larvicides increases with an increase in volatility, the more volatile oils producing the more marked lethal effects. The volatile constituents of the oils contain the principles that produce the primary lethal effects. The lethal effects are produced by the penetration of the tracheal tissue by the volatile gases of the oils. In the heaviest and least volatile oils (those having a boiling point greater than 250° C.) this action may be supplemental or apparently secondary to the effect of actual contact of the oil with the body tissue or perhaps to mechanical means such as suffocation or plugging of the tracheæ."

New genera and species of muscoid flies, C. H. T. TOWNSEND (*Proc. U. S. Nat. Mus.*, 51 (1917), pp. 299-323).—Twenty-eight genera are erected and 27 species described as new to science.

Storage of manure and fly suppression at Durban remount depot, C. K. BRAIN (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 339-341).—A report upon observations made by the author in Natal.

Genera of the dipterous tribe Sarcophagini, C. H. T. TOWNSEND (*Proc. Biol. Soc. Wash.*, 30 (1917), pp. 189-198).—The author gives tables for the separation of both males and females of genera of Sarcophagini, a list of genotypes of the new genera, of which there are 20, and descriptions of 6 new species.

Notes on the Ethiopian fruit flies of the family Trypaneidae, other than *Dacus*, II, M. BEZZI (*Bul. Ent. Research*, 9 (1918), No. 1, pp. 13-46, pl. 1, figs. 3).—This second paper (*E. S. R.*, 39, p. 362) includes descriptions of 1 subgenus, 17 species, and 1 variety new to science.

Danger of introducing fruit flies into the United States, E. A. BACK (*U. S. Dept. Agr. Yearbook 1917*, pp. 185-196, pls. 8).—The author calls attention to the danger of introducing fruit flies into this country, including the Mediterranean fruit fly (*Ceratitis capitata*) (*E. S. R.*, 39, p. 154), the olive fruit fly (*Dacus oleæ*), the melon fly (*Bactrocera cucurbitæ*) (*E. S. R.*, 39, p. 154), the Mexican fruit fly (*Anastrepha ludens*), the papaya fruit fly (*Toxotrypana curvicauda*), the West Indian fruit fly (*A. fraterculus*), the banana fruit fly (*B. curvipennis*), the pineapple fruit fly (*B. xanthodes*), the Queensland fruit fly (*B. tryoni*), and other fruit flies which may develop into pests.

A native food plant of *Rhagoletis fausta*, H. H. P. SEVERIN (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 325-327).—The author finds that the wild red, bird, fire, or pin cherry (*Prunus pennsylvanica*) in Maine is a host of the black-bodied cherry fruit fly.

Some notes on the bionomics of the buffalo fly (*Lyperosia exigua*), G. F. HILL (*Proc. Linn. Soc. N. S. Wales*, 41 (1916), pt. 4, pp. 763-768, pl. 1).—These notes relate to the introduction of *L. exigua* into Australia and its local distribution, early stages, life history, habits, natural enemies, and methods of control.

Biological notes on some flat-headed wood borers of the genus *Buprestis*, H. E. BURKE (*Jour. Econ. Ent.*, 11 (1918), No. 3, pp. 334-338).—Notes are presented on 17 species.

The western cedar borer, *Trachykele* sp., R. N. CHRYSAL (*Agr. Gaz. Canada*, 4 (1917), No. 11, pp. 946-949, figs. 5).—This is a brief report of work, commenced in the fall of 1915 and continued through 1916, on a buprestid wood borer which bores extensively in the sapwood and heartwood of both green and dead cedar, and is the source of considerable loss in British Columbia.

A lead-boring beetle (*Xylothrips gibbicollis*), W. W. FROGGATT (*Agr. Gaz. N. S. Wales*, 28 (1917), No. 11, p. 814, fig. 1).—A bostrychid beetle (*X. gibbicollis*), recently described from southern Queensland under the name *Bostrychus gibbicollis* and which is now known to have a wide distribution over

Australia, has become a source of injury through perforating the lead sheathing used to protect overhead telephone wire. The damage caused is due to the moisture which enters the cable and destroys the insulation.

The palm weevil (*Rhynchophorus palmarum*), N. VAN GORKUM (*Bol. Min. Agr., Indus. e Com.* [Brazil], 5 (1916), No. 2, pp. 59-75, pls. 5).—This report of studies of the palm weevil in Brazil is accompanied by colored illustrations of its life stages.

A wasted sugar supply, E. F. PHILLIPS (*U. S. Dept. Agr. Yearbook 1917*, pp. 395-400, pls. 2).—The author shows that by good management beekeeping may be so increased as to save profitably and economically much of the sugar in nectar secreted by flowers now wasted.

The diagnosis of bee diseases by laboratory methods, A. H. MCCRAY and G. F. WHITE (*U. S. Dept. Agr. Bul. 671* (1918), pp. 15, pls. 2).—During the course of investigations extending over a period of many years the authors have developed and perfected methods and technique in the diagnosis of known diseases of bees which are here described for the benefit of others who may engage in similar work.

Diseases of bees: Their detection and treatment, H. W. COLEY (*Connecticut State Sta. Bul. Immed. Inform. 8* (1918), pp. 4).—A popular account.

Descriptions of miscellaneous North American chalcidoid Hymenoptera of the family Eulophidae, A. A. GIRAULT (*Proc. U. S. Nat. Mus.*, 51 (1917), pp. 33-52).—The genera *Stenomasioides*, *Tetrastichomyia*, and *Ephopalotus* are erected and 20 species and 2 varieties are described as new.

New North American Hymenoptera of the family Eulophidae, A. A. GIRAULT (*Proc. U. S. Nat. Mus.*, 51 (1917), pp. 125-133).—The genera *Mirolynx* and *Tetrastichopsis* are erected and 11 species described as new. *Tetrastichus asparagi* is recorded from Jordan, Ontario, and *Tetrastichopsis prionomeri* n. g. and n. sp. was reared from *Prionomerus calceatus* at Clarksville, Tenn.

On a species of *Dibrachys*, a chalcid parasite of the granary weevil (*Calandra granaria*), F. BURCKART (*Centbl. Bakt. [etc.]*, 2. Abt., 46 (1916), No. 22-23, pp. 502-504; abs. in *Internat. Inst. Agr.* [Rome], *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 1, pp. 170, 171).—A pteromalid of the genus *Dibrachys* near *D. acutus* has been reared by the author from the granary weevil kept in breeding cages, making the fifth parasite to be reared from this host.

Ichneumonoid parasites of the Philippines, I. C. F. BAKER (*Philippine Jour. Sci., Sect. D.* 12 (1917), No. 5, pp. 281-327).—This paper deals with the Rhogadinae, a subfamily of Braconidae, parasitic on various Coleoptera and Lepidoptera of economic importance. Eight genera are erected and 21 species belonging to 13 genera are described as new.

A note on the fate of the ova of *Ankylostoma* ingested by the larvæ of *Musca domestica*, P. L. QUERENS (*New Orleans Med. and Surg. Jour.*, 70 (1918), No. 8, pp. 653-655).—Fifty adult flies reared from larvæ that had developed on infected feces were dissected by the author, who failed to find *Ankylostoma* ova or larvæ in their intestinal tracts.

FOODS—HUMAN NUTRITION.

Hydration capacity of gluten from "strong" and "weak" flours, R. A. GORTNER and E. H. DOHERTY (*Jour. Agr. Research* [U. S.], 13 (1918), No. 8, pp. 389-418, figs. 17).—Experiments carried on at the Minnesota Experiment Station to determine what correlation, if any, exists between the baking qualities of the flour and the hydration capacity of the gluten are here reported.

The authors present data showing the increase or decrease of water imbibition caused by immersing weighed disks of gluten from five selected flours in solutions of lactic, acetic, boric, phosphoric, hydrochloric, and oxalic acids of various concentrations, both with and without the addition of 0.005 molar concentrations of certain salts. Data have also been presented showing different flour analyses such as ash on dry flour, soluble ash, specific conductivity of flour extract, percentage of moist gluten, percentage of dry gluten, percentage of ash in dry gluten, and baking tests. From a study of these data, they have drawn the following conclusions:

"Although the moist glutens from these flours differ widely in 'quality' and in physical properties, they are hydrated to almost exactly the same extent. Gluten from a weak flour has a much lower rate of hydration than gluten from a strong flour. Gluten from a weak flour has a much lower maximum hydration capacity than gluten from a strong flour, changing from a gel to a sol at a much lower degree of hydration.

"Two types of imbibition curves were observed. Dilute solutions of hydrochloric acid and of oxalic acid cause the gluten to imbibe water rapidly, while at slightly stronger concentrations of acid water is actually extracted from the moist gluten. Dilute solutions of lactic, acetic, and phosphoric acids cause the gluten to imbibe water strongly but stronger acid solutions only slightly diminish the imbibition. The hydrogen-ion concentration of the acid is not the only factor influencing imbibition, but it is pointed out that the anion and the undissociated molecules, as well as their relative adsorption by the protein, must in all probability be taken into consideration.

"Inorganic salts when added to an acid solution lower the relative imbibition of gluten placed in such solutions. Glutens from the different flours react differently to the addition of inorganic salts. The acid and salt contents of the flours are not responsible for the difference between a strong and weak gluten.

"The postulation that the different physical conditions observed in glutens derived from different flours are due solely to the presence or absence of an electric double layer around the colloidal particles is not consistent with the facts recorded in this paper. A strong gluten would differ from a weak gluten even at the isoelectric point.

"There is an inherent difference in the glutens from the strong and weak flours. The physico-chemical properties of the glutens from the different flours are not identical and would not be identical even if the flours had originally had the same acid and salt content.

"The difference between a strong and weak gluten is apparently that between a nearly perfect colloidal gel with highly pronounced physico-chemical properties, such as pertain to emulsoids, and that of a colloidal gel in which these properties are much less marked. It is suggested that such differences may be due to the size of the gluten particles and that at least a part of the particles comprising the weak gluten may lie nearer the boundary between the colloidal and crystalloidal states of matter than is the case with the stronger glutens."

A test of the bread making qualities of wheats, W. P. HEADDEN (*Colorado Sta. Bul. 244* (1918), pp. 8-32).—Baking tests and other observations, made on the bread making and other properties of the wheats and flours produced in the experimental work previously noted (E. S. R., 37, p. 38) and of some flours produced from Colorado wheats by various mills in the State, are reported and discussed.

It was found that "the soil conditions produce distinctive characteristics of composition and properties in the flour similar to those produced in the grain,

which express themselves in the baking qualities of the flour and the characteristics of the loaf."

"The milling qualities of the wheat are closely related to the physical and chemical qualities. The baking qualities of the flour are related to the hardness or softness of the wheat. The process of milling is of very great importance in determining the quality of the flour produced.

"Colorado wheat is mostly hard enough to produce good bread-making flour. Flour produced in Colorado from Colorado wheat is usually good flour. Some of the better grades of Colorado flours compare favorably with the best commercial flours.

"Flour made from dryland wheat is identical in quality with flour made from the same kind and quality of wheat grown with irrigation. Dry-land wheat yields more bran than irrigated wheat.

"Shrunken wheat yields more bran than plump wheat. Flour made from shrunken wheat is not poorer in quality than that made from plump wheat. The quality of such flour depends upon the cause of the shrunkenness; if it be caused by the presence of nitrates the quality will be high, it may be higher than that of flour made from plump grain of the same variety."

Use of wheat flour substitutes in baking, HANNAH L. WESSLING (*U. S. Dept. Agr., Farmers' Bul. 955 (1918), pp. 22*).—This publication suggests some of the ways in which substitutes for wheat flour may be used in baking. Recipes and directions for making are given for both yeast breads and the quick breads, and for cookies, pastry, etc. A score card for judging breads made by substituting part of the wheat flour with other cereals is given.

The sprouting capacity of grains [lentils and peas] issued as rations to troops, E. D. W. GREIG (*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 818-823*).—It has been shown that the antiscorbutic value of legumes can be markedly increased by allowing them to sprout, and the question is deemed one of great importance for the preservation of health of Indian troops. A series of observations, which are reported in this article, have been made regarding the capacity for sprouting of the lentils and peas actually supplied to such troops on service.

It was found that the process of crushing the lentils destroys to a considerable extent their capacity for sprouting, but does not deprive them entirely of this power. However from the point of view of the prevention of scurvy, the uncrushed seed is to be preferred as it gives the maximum yield in regard to sprouting and, therefore, of antiscorbutic vitamin. In samples which had germinated 24 hours the whole grain softened and emulsified well on boiling. Samples that had germinated 48 and 72 hours, respectively, did not work so satisfactorily. Thus from the point of view of cooking, 24 hours' germination appears to be the optimum period.

Even under severe conditions it is thought quite possible to arrange for germination of the seeds (lentils and peas). Spreading the seeds out between clean blankets that have been moistened and kept moist, would meet the requirements and would produce abundant germination at fairly high temperatures.

The sprouting of lentils has great practical advantages as it enables antiscorbutic vitamins to be manufactured immediately prior to consumption, a point of very great importance as these vitamins are extremely fragile and sensitive, being completely destroyed by drying.

The peanut, a great American food, H. S. BAILEY and J. A. LE CLERC (*U. S. Dept. Agr. Yearbook 1917, pp. 289-301, figs. 4*).—The importance of the peanut as one of the cheaper nutritious foods adaptable to many purposes on a food conservation program or in the ordinary diet is emphasized.

"A pound of whole peanuts, as used in confections, peanut butter, etc., contains nearly one-half pound of fat and one-fourth pound of protein, both the oil, or fat, and the protein being of a very high grade and readily digestible."

Peanuts yield, upon pressing, an oil valued as one of the most important of the food oils. The peanut press cake is now utilized for peanut flour, a valuable wheat substitute.

"It should be understood that the peanut is a food, not a condiment, and therefore can be used to replace flour, meat, or fat."

A few recipes are given.

Feeding experiments with peanuts, AMY L. DANIELS and ROSEMARY LOUGHLIN (*Jour. Biol. Chem.*, 33 (1918), No. 2, pp. 295-301, figs. 3).—In the feeding experiments with laboratory animals (rats) here reported it was shown that the peanut needs only to have added suitable inorganic elements and the fat-soluble food accessory to make it a complete food.

The proteins of the peanut furnish the essential amino acids in sufficient amount for normal growth and reproduction when rations made on the basis of 15 and 18 per cent protein are fed. Peanuts were found to be lacking especially in calcium, potassium, magnesium, and sulphur, but the peanut meal, which includes a considerable proportion of hulls, apparently contains sufficient amounts of these constituents.

The banana: A food of exceptional value, S. C. PRESCOTT (*Sci. Mo.*, 6 (1918), No. 1, pp. 65-75).—The food value of the banana is emphasized and greater use of it advocated. Analyses are included.

Stability of olive oil, E. B. HOLLAND, J. C. REED, and J. P. BUCKLEY, JR. (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 7, pp. 353-366, fig. 1).—Observations covering six years of the changes which take place in olive oil due to the action of air, light, and moisture, singly and combined are here reported from the Massachusetts Experiment Station in continuation of previous work (*E. S. R.*, 24, p. 212). The practical deductions drawn, which should prove of value to those handling oil commercially, are as follows:

"From an economic standpoint air caused a slow destruction of color in olive oil, the production of rancidity, and the decomposition of unsaturated acids. Light caused an active destruction of color and a slow production of rancidity. Air-light caused the most active and effective destruction of color, active destruction of unsaturated acids, a rapid production of rancidity, and a slow but marked production of free fatty acids.

"Moisture caused the production of a precipitate, a turbid oil, and free fatty acids. Air-moisture practically duplicated the effect of air plus that of moisture, and light-moisture that of light plus that of moisture. Air-light-moisture exceeded the effect of air-light plus that of moisture in the amount of free fatty acids produced; otherwise it was essentially the same.

"In order to preserve olive oils in their natural state air, light, and moisture should be excluded as completely as possible, particularly the combined action of air and light, which has proved exceedingly destructive."

Milk necessary for the Nation's welfare, E. B. HART and H. STEENBOCK (*Wisconsin Sta. Bul.* 291 (1918), pp. 20, figs. 12).—The importance of milk as a growth-promoting food is emphasized and its value when used in combination with other foods as part of a well-balanced ration is shown by illustrations from animal feeding.

Alligators as food, A. M. REESE (*Science*, n. ser., 47 (1918), No. 1226, pp. 640, 641).—This article reports a test of alligator meat for human food by a group of about 30 people in Morgantown, W. Va. The meat was prepared by parboiling, rolling in egg and cracker crumbs, and frying. All who tasted the

meat declared it to be most agreeable. It is suggested that in the Southern States the alligator meat, which is now thrown to the carrion crows and buzzards after removing the hides, be utilized for human food.

The service of cold storage in the conservation of foodstuffs, I. C. FRANKLIN (*U. S. Dept. Agr. Yearbook 1917, pp. 363-370, pl. 1*).—The development of the cold-storage industry and something of its uses and abuses are treated of in this article. The author points out that "dealers and warehousemen now have learned that cold storage does not improve foodstuffs, but that if products are in excellent condition when placed in storage and are properly cared for while in storage they will serve as wholesome food when withdrawn for market within certain time limits. . . . Many, if not most, commodities will not stand storage for more than one season without deterioration. When offered for sale after two seasons' holding, unaccompanied by the history of their storage, such products tend to create prejudice against all storage stocks. . . . If the traditional prejudice against cold-storage foodstuffs were removed and the storage space of the country largely increased, much more could be done toward stabilizing both production and prices of perishable foodstuffs."

Food surveys (*U. S. Dept. Agr., Bur. Markets, Food Surveys, 1 (1918), Nos. 4, pp. 19, figs. 26; 5, pp. 22, figs. 32; 6, pp. 19, figs. 24; 7, pp. 23, figs. 28; 9, pp. 31, figs. 41*).—These numbers contain, respectively, data as to the commercial stocks reported in the food survey of January 1, 1918, for lard, lard compounds, solid vegetable cooking fats, oleo stock, oleo oil, and edible tallow, cottonseed oil, olive oil, and peanut oil; corn, oats, barley, rye, and the food products made from these cereals; sugar, sirup, molasses, honey, candy, and food starches; dairy products, eggs, ice cream, margarin, and peanut butter; and meat and meat products.

Food surveys (*U. S. Dept. Agr., Bur. Markets, Food Surveys, 1 (1918), No. 8, pp. 8*).—A report of the commercial stocks of wheat, corn, barley, and rye held on June 1, 1918, in elevators, grain warehouses, general warehouses, and grain mills, and by wholesale grain dealers is here given, along with the stocks of various kinds of flours and meals held by the above dealers and by wholesale grocers, as well as the stocks of certain nonperishable food products and condensed and evaporated milk held by wholesale grocers.

The international Jewish cookbook, FLORENCE K. GREENDAUM (*New York: Bloch Publishing Company, 1918, pp. XII+419*).—This book aims to lay emphasis on characteristic Jewish dishes, including time-honored recipes which have been handed down by Jewish housewives for the Sabbath, Passover, etc., and is a modern "kosher" cookbook. It contains also favorite recipes of Germany, Hungary, Austria, France, Russia, Poland, and Roumania, as well as America, adapted to Jewish dietary customs.

Tissue-forming foods (*Pub. Health Bul. [Mass.], 5 (1918), No. 3, pp. 66-70*).—A discussion of protein requirements and protein foods.

Fats and their value in the diet (*Pub. Health Bul. [Mass.], 5 (1918), No. 5, pp. 119-124*).—A discussion of edible fats and their dietetic values, along with suggestions for the conservation of fat.

Food for children from two to six years old (*Pub. Health Bul. [Mass.], 5 (1918), No. 2, pp. 35-46*).—Foods suitable for children of different ages are listed according to their content of fats, carbohydrates, protein, etc. A special effort is made to show how the conservation program may be adapted to the needs of the child.

The children's diet in war time, AGNES F. MORGAN (*Cal. Bd. Health Mo. Bul., 13 (1918), No. 12, pp. 522-526*).—Certain well-established rules governing the selection of food for children from 1 to 6 years of age are presented as modified

by the necessity for conservation during war time. The salient points brought out are summarized as follows:

"Feed the child a quart of milk a day, plenty of eggs, fish, green vegetables, potatoes, corn, oats or rice, fresh fruits, and butter; be careful as to the texture and digestibility of the food, and the regularity of meals, and his health and growth will be as well guarded as diet can assure. Wheat, meat, fats, other than butter, sugar as such, may be eliminated altogether."

ANIMAL PRODUCTION.

The composition of peanuts and peanut by-products, G. S. FRAPS (*Texas Sta. Bul. 222 (1917), pp. 5-38*).—This bulletin contains data upon the composition and feeding value of the peanut and its various by-products, and gives tabulated analyses from various sources.

"Peanut hay without nuts has a higher productive value than alfalfa but less digestible protein. Peanut hay with nuts has a high feeding value on account of the nuts present. Whole Texas peanuts average 25.5 per cent protein and 36.6 per cent fat from 58 analyses. They vary considerably. Texas peanuts are richer in protein than peanuts grown in the East, though some eastern peanuts may be fully equal to Texas peanuts.

"Pure peanut hulls are high in fiber and have no feeding value, though they may be used as a filler. Commercial hulls contain some kernels and have a feeding value about one-half that of rice hulls or one-third that of cottonseed hulls.

"Peanut kernels are rich in protein and fat, eastern kernels averaging less protein than Texas. Individual peanut kernels may vary decidedly in protein and fat content. A sufficient number of kernels to overcome individual variations should be taken for analyses.

"Texas whole pressed peanuts calculated from the peanuts should average 37.9 per cent protein and 25.7 per cent fiber, but the samples on the market average less fiber. Two grades of Texas whole pressed peanuts should be made, on account of the variation in the composition.

"Texas peanuts can be made into choice meal containing 55 per cent protein and fat combined, or prime meal containing 51 per cent protein and fat combined. The crude fiber content calculated from the peanuts analyzed is more than that found in the peanut cake or meal actually on the market.

"Methods are given for the calculation of the whole pressed peanuts or peanut cake or meal secured from a sample of peanuts of known analysis. A method is given for calculating the hull content of peanut by-products from the fiber content. The feeding values of peanut by-products are discussed. Choice peanut cake and prime peanut cake actually on the Texas market are practically equal to prime or choice cottonseed cake on the market. Whole pressed peanuts are practically equal to whole pressed cottonseed in productive value, though they contain much more digestible protein."

The yields of oil and cake and the grades of peanuts are discussed. The kernel content is deemed an important character. "Standards for peanut products corresponding to cottonseed products are desirable from a manufacturing standpoint, but on account of the high protein content of peanut kernels it is not advisable to adopt the lower standards for peanut products. If the definition of prime peanut meal as containing 34 per cent protein proposed by the Interstate Cottonseed Crushers' Association should be adopted it would permit the sale of whole pressed peanuts under the name of prime peanut meal. There are some eastern peanut meals that contain only 34 per cent protein, and it is

possible that a definition can not be made on a protein basis that will distinguish between whole pressed peanuts and the true peanut meal low in protein."

Mineral constituents, starches, sugars, and pentosans are reported for various peanut products.

[Feeding experiments with steers and swine], E. S. GOOD (*Kentucky Sta. Rpt. 1917, pt. 1, pp. 23, 24*).—Three years' experiments to determine the residual effect of the winter feeding of corn silage on the ability of steers to gain on pasture the following summer gave results favorable to the use of silage. Two-year-old steers were finished in close confinement and on a run of a 20-acre pasture, the same amount of feed being given each lot. Those confined made more rapid and economical gains than those on pasture. The manure recovered from the steers in confinement was nearly twice that recovered from the lot on pasture. With growing and fattening stockers the addition of corn silage to the winter ration increased the profits fivefold.

A progress report of experiments in the hogging-down of soy beans indicates that it is unprofitable to hog-down soy beans alone but that it is very profitable to hog-down soy beans and corn growing in the same field or to feed corn to hogs running on soy beans. A 2 per cent ration of corn was more profitable under such circumstances than corn in a self-feeder. Velvet-bean meal was much inferior to either digester tankage or soy beans as a supplement to corn for fattening hogs on dry lot.

Pasture trials, M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917, p. 11*).—Continuing work previously noted (*E. S. R., 37, p. 271*), cows gained an average of 60.5 lbs. in weight each and produced \$16.29 worth of milk fat per acre on pasture without grain from June 1 to October 1. The pasture suffered from drought during the season. Young stock made an average daily gain of 0.527 lb. per head on pasture from June 1 to October 18, 1917, as compared with 1.59 lbs. during the pasture season of 1916.

Pasturing alfalfa with cattle, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1916, pp. 21, 22, fig. 1*).—In a grazing test begun June 6 eight Hereford steers were pastured on 4 acres of Peruvian alfalfa in which Sudan grass had been seeded. The soil was very sandy and had been cropped for five years. The steers were moved from one half the pasture to the other and the alfalfa was irrigated every 14 days. They gained 410 lbs. per acre in 122 days of grazing. With beef at 6.5 cts. per pound the net return per acre was \$26.25.

Preliminary report on steer feeding experiments, 1914-15 and 1916-17, G. E. MARTIN and T. E. LEIPER (*Colorado Sta. Inform. Bul., 1918, Jan., pp. 8*).—A brief preliminary report is made of experiments conducted in 1914-15 and 1916-17 for the purpose of comparing corn with barley, determining the advantage of adding corn silage to a ration of barley and alfalfa, and comparing sugar-beet pulp with corn silage. Ten steers were fed in each lot, alfalfa being fed ad libitum.

One year's results indicate that barley has 95 per cent the feeding value of corn when fed with alfalfa for fattening steers. Corn did not materially increase the rate of gain compared with barley. There was slight difference, if any, in the average cooled carcass of the steers fed barley with alfalfa hay and those fed corn with alfalfa hay.

The addition of silage to a barley-alfalfa ration did not increase the average rate of gain per day. One ton of silage replaced 128 lbs. of barley and 0.297 ton of alfalfa.

Results of two years indicate that pulp in a sugar-beet molasses, cottonseed cake, alfalfa ration increased the average rate of gain 10 to 28 per cent, com-

pared with corn silage fed in the same ration. Pulp had from 40 to 60 per cent the fattening properties of corn silage. Steers consuming pulp ate less sirup and cottonseed cake and more alfalfa per 100 lbs. gain than those consuming corn silage.

Tables are given showing the value of silage when alfalfa and barley are quoted at various prices, and the cost of pulp at various factory prices when laid down at various distances from the factory.

[Feeding experiments with steers], E. S. GOOD (*Kentucky Sta. Rpt. 1916, pt. 1, pp. 25-28*).—A brief account is given of the third year's experiment to determine the residual effect of the winter feeding of corn silage on the ability of steers to gain on pasture the following summer, together with a summary of the three years' tests.

During the winter of 1915, 10 yearling steers were fed 161 days on dry lot a ration of cottonseed meal, corn silage, clover hay, and oat straw. They gained an average of 1.31 lbs. per head daily at a cost of 8.6 cts. per pound of gain. During the same period the control lot of 10 steers on cottonseed meal, clover hay, and oat straw gained an average of 0.97 lb. at a cost of 13.98 cts. per pound of gain. Both lots were put on good blue-grass pasture May 11, 1916, and given no supplemental feed.* By October 24 the silage lot had gained 212 lbs. and weighed 1,095 lbs. per steer, and the control lot had gained 245 lbs. and weighed 1,082 lbs. per steer. Results secured during the three years indicate that where steers are given a ration containing corn silage during the winter they will gain about as well on pasture the following summer as will steers making similar gains during the winter on a ration containing no silage, and at the same time the cost of production is materially reduced.

In a comparison of confining 1,000-lb. steers in the barn v. barn and 20-acre pasture, two lots of steers were fed similar rations of shelled corn, cottonseed meal, sorghum silage, and oat straw. During the test, which lasted from November 25, 1915, to April 24, 1916, the lot having the run of blue-grass pasture gained an average of 1.82 lbs. per steer daily, and the lot confined 2.13 lbs. Not considering the pork produced or the cost of pasture, the cost of gains was 1.52 cts. per pound more for the range lot than for the confined lot.

Two lots of steers that had gained 1.35 lbs. per head daily during the winter were finished on pasture the following summer. One lot on pasture was given an average daily ration of 9.8 lbs. of broken ear corn, 2.24 lbs. of cottonseed meal, and 9.6 lbs. of sorghum silage. The other lot was given nothing in addition to the pasture. The lot receiving grain on pasture averaged 1,271 lbs. per head August 3, and sold for 8.5 cts. per pound, showing a loss of \$1.40 per steer, while the other lot weighed 1,233 lbs. each, and sold for 8 cts. a pound, showing a profit of 45 cts. per steer. On account of the abnormal pasture conditions during this test the results are not deemed conclusive.

Digestibility of corn silage, velvet-bean meal, and alfalfa hay when fed singly and in combinations, P. V. EWING and F. H. SMITH (*Jour. Agr. Research [U. S.], 13 (1918), No. 12, pp. 611-618*).—Continuing this series of investigations (E. S. R., 37, p. 65), results are given of work done at the Georgia Experiment Station upon the question of the digestibility of rations made up of corn silage, velvet-bean meal, and alfalfa hay. Analyses are given of the feeds used. The animals were 2-year-old North-Georgia Shorthorn steers. Nine different rations were used, the first three being made up of one feeding stuff each, the next three of two feeds each, and the last three containing three feeds each. The digestion trials of 12 days each were made in triplicate.

The average digestion coefficients of the three feeds alone and in combination are given in the following table:

Coefficients of digestibility obtained in digestion experiments with steers.

Feed.	Method of feeding.	Dry matter.	Ether extract.	Crude fiber.	Ash.	Nitrogen.	Nitrogen-free extract.
Corn silage.....	Alone.....	69.02	74.10	77.57	25.96	35.00	71.37
	With alfalfa hay.....	60.33	42.04	80.52	15.82	23.75	58.49
	With velvet-bean meal.....	59.53	80.39	64.74	48.95	17.78	62.44
	With alfalfa hay and velvet-bean meal.....	56.58	81.21	55.45	15.06	19.07	64.18
Velvet-bean meal.....	Alone.....	83.91	76.04	78.95	56.36	75.95	90.62
	With corn silage.....	77.43	78.51	64.03	65.38	71.11	84.67
	With alfalfa hay.....	79.52	75.43	63.03	67.46	75.17	86.98
	With corn silage and alfalfa hay.....	74.17	77.63	50.96	44.48	72.25	82.95
Alfalfa hay.....	Alone.....	62.79	41.91	57.99	45.83	69.56	69.55
	With corn silage.....	61.85	32.03	58.21	42.37	66.94	64.52
	With velvet-bean meal.....	53.75	45.82	50.67	52.07	68.44	64.88
	With corn silage and velvet-bean meal.....	53.67	33.26	45.25	39.11	65.06	60.60

It is concluded that "the combining of these feeds in general tends toward lowering the digestibility of the several nutrients of the rations. The digestion of corn silage, alfalfa hay, and velvet-bean meal is apparently fairly constant under the different combinations. More accurate digestion coefficients are obtained by feeding-alone experiments, where such are possible, rather than by the usual difference method. Greater variations are presented in the apparent digestibility of nitrogen and ash than in other nutrients. Compared with similar feeds, velvet-bean meal is apparently well digested."

A study of the physical changes in feed residues which take place in cattle during digestion, P. V. EWING and L. H. WRIGHT (*Jour. Agr. Research* [U. S.], 13 (1918), No. 12, pp. 639-646).—The data here reported were obtained in studies made at the Georgia Experiment Station on the rate of passage of feed residues through steers (E. S. R., 37, p. 673). This report deals with the physical changes which take place in rations during the process of digestion, and covers these changes with relation to the several organs and steps in digestion rather than the process of digestion as a whole.

The feeds used were corn silage made from stalks from which the ears had been removed and cottonseed meal. The silage was so cut as not to pass through a 2-mm. screen, and the cottonseed meal was prepared by passing it first through a 15-mesh screen and later through a 20-mesh screen. Analyses are given of the feeds thus prepared. The rations were so prepared that of those in which both feeds appeared actual quantitative and qualitative slaughter tests of the component parts of the rations could be made.

When the rations were made up of silage alone, the extent of comminution taking place before the food left the rumen and reticulum amounted to 65.8 per cent in the smaller ration and to 58.5 per cent in the larger ration. When to these two rations were added the 60 and 40 per cent of cottonseed meal, an increase resulted in the extent of comminution of 5.1 and 10.5 per cent. The amount of comminution taking place in the omasum ranged from 6.3 to 18.6 per cent, the greater amount taking place with those rations made up of silage and cottonseed meal, and the least amount in the ration containing the smaller amount of silage alone. The comminution in the abomasum varied from 5.3 to 11.2 per cent, the greater amount being in those rations made up of coarse

feeds. In the small and large intestines the extent of comminution was much less than in the previous stages of digestion, and was more or less completely overshadowed by absorption.

Averaging all the rations, the time required for the passage of residues through the several organs was 61.07 hours for the rumen and reticulum, 7.88 hours for the omasum, 2.83 hours for the abomasum, 6.72 hours for the small intestine, and 7.58 hours for the large intestine.

Growth of the beef-cattle industry in the South, F. W. FARLEY (*U. S. Dept. Agr. Yearbook 1917*, pp. 327-340, pls. 4).—This article describes the beef-cattle industry in the South, briefly considers the factors involved in the recent growth of the industry, and outlines the results of beef-cattle extension work in the South conducted by the U. S. Department of Agriculture in cooperation with the various State colleges of agriculture and experiment stations.

Hides and skins: Production, foreign trade, supply, and consumption, G. K. HOLMES (*U. S. Dept. Agr. Yearbook 1917*, pp. 425-426).—A statistical review of the world's production and consumption of hides and skins, with special reference to the leather supply of the United States.

The inheritance of mutton points in sheep, K. J. J. MACKENZIE and F. H. A. MARSHALL (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 29 (1917), pp. 37-49).—A report of a study of the inheritance of mutton points in 28 F₁ Merino ♂ × Shropshire ♀ sheep and 42 F₁ sheep bred from the above F₁ cross. The "points" studied were (1) over the shoulder, (2) behind the shoulder, (3) the loin, and (4) the top of the leg. These points were selected because of their ease to judge and because experience indicates that they differ materially in the Merino and Shropshire breeds.

Grouping the four points, the F₁'s were classified at 31.2 per cent Merino-like, 33.9 per cent Shropshire-like, 10.7 per cent composite, and 24.1 per cent doubtful. The F₁'s were classified 44.3 per cent Merino-like, 21 per cent Shropshire-like, 14.2 per cent composite, and 20.3 per cent doubtful. This classification indicates that segregation of the four mutton points had taken place to a marked extent among the crossbred sheep, and that this segregation is almost as marked in the F₁ as in the F₂.

Sheep and intensive farming, F. R. MARSHALL (*U. S. Dept. Agr. Yearbook 1917*, pp. 311-320, pls. 2).—The author analyzes the trend of sheep raising in the United States, and points out that the best practices for the most effective and economical use of the land in the immediate future and in the period following the war favor the adoption of sheep raising as a side line in intensive farming.

Wool: Production, foreign trade, supply, and consumption, G. K. HOLMES (*U. S. Dept. Agr. Yearbook 1917*, pp. 401-424).—A statistical review of the number of sheep throughout the world, the production of wool in the world, imports of wool into various countries, wool supply of the United States, exports of domestic wool, foreign trade surplus, and consumption of wool, prices of sheep and wool, and the stocks of wool on hand in 1917. The effect of substitute fibers and matings upon the wool scarcity is noted.

Pig feeding experiment, J. M. SCOTT (*Florida Sta. Rpt. 1917*, p. 27).—Two lots of eight 100-lb. pigs each were fed for 59 days. Lot 1, on shelled corn, gained 0.88 lb. per head daily and required 7.3 lbs. of feed per pound of gain. Lot 2, on shelled corn and sweet potato silage (2:1) gained 0.16 lb. per head daily and consumed 16.6 lbs. of feed per pound of gain.

[Feeding experiments with pigs], M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917*, pp. 12, 13).—Sixty-four Yorkshire pigs were weaned at four weeks and fed until six weeks of age on milk and grain. The grain rations

were fed in a self-feeder and were made up of tankage, ground oats, shorts, and hominy. During the two weeks each pig consumed 5.5 lbs. of grain, at a cost of 13 cts., and 9 gal. of skim milk and buttermilk, at a cost of 28 cts.

Brood sows were successfully wintered on one feed of grain and one of rutabagas daily, their ration during the late spring consisting of a 1.5 per cent ration of grain, garbage, and skim milk or buttermilk. Pasture supplemented with milk alone failed to maintain the weight of dry sows after the spring litters of pigs were weaned. One lb. of grain with pasture and buttermilk insured strong fall litters.

Swine feeding (*Minnesota Sta., Rpt. Morris Substa., 1916, pp. 23, 24*).—In a test lasting 102 days from June 10, 1916, four lots of 15 pigs each from 9 to 12 weeks of age were used. Lots 1 and 2 were fed in dry lot and lots 3 and 4 had access to alfalfa pasture. In addition lots 1 and 4 were hand fed ground barley, wheat middlings, and tankage (7:2:1) and lots 2 and 3 had access to the above feeds kept in separate compartments of a self-feeder. Lot 1 made an average daily gain of 0.99 lb. per head, and required 4.68 lbs. of grain to produce a pound of gain. The corresponding gains and feed requirements for the other lots were 1.1 and 4.6 lbs. for lot 2, 1.19 and 4.31 lbs. for lot 3, and 1.1 and 4.25 lbs. for lot 4, respectively.

During the test the alfalfa on which the pigs grazed produced about one-half as much hay as the adjoining alfalfa fields not pastured.

Swine feeding, P. E. MILLER (*Minnesota Sta., Rpt. Morris Substa., 1917, pp. 39, 40*).—Four lots of 15 9- to 12-week-old pigs each were fed 103 days from June 15, the test being a duplicate of the one noted above for the previous year. During the test lot 1 made an average daily gain of 1.26 lbs. per pig and required 4.09 lbs. of grain per pound of gain. The corresponding figures for the other lots were 1.23 and 4.22 lbs. for lot 2, 1.35 and 3.98 lbs. for lot 3, and 1.31 and 4.02 lbs. for lot 4, respectively. As in the previous test the pigs reduced the yield of alfalfa hay about one-half.

Soft pork from rice bran, H. E. DVORACHEK and H. A. SANDHOUSE (*Arkansas Sta. Bul. 142 (1918), pp. 3-8, fig. 1*).—In continuation of previous work (E. S. R., 36, p. 768) an experiment was conducted to determine whether or not rice bran as an exclusive ration would produce soft pork, and, if so, whether the use of other feeds in connection with rice bran would result in a satisfactory quality of pork. In the test six lots of six 75-lb. shotes each were fed for 16 weeks during the hot summer months as follows: Lot 1 rice bran alone; lots 2, 3, and 4 rice bran alone for the first 8 weeks; lot 5 rice bran and rice polish (1:1); and lot 6, rice bran and tankage (9:1). For the last 8 weeks of the experiment lot 2 was fed rice bran and cottonseed meal (3:1), lot 3 rice bran and corn (1:1), and lot 4 corn and tankage (12:1). The average daily gains per hog for the respective lots were 0.71, 0.82, 0.79, 1.01, 0.92, and 0.74 lbs.

At the close of the test the hogs were shipped to Kansas City, where they were slaughtered by lots. The carcasses were chilled for 48 hours, after which they were cut and the quality of the pork compared by expert meat packers. The melting points of samples of lard from the back fats from each lot were determined by the station chemist. The following conclusions are drawn:

"Rice bran when fed alone produced a soft, oily fat, somewhat grayish in color. The use of cottonseed meal with rice bran for 8 weeks did not have any tendency to harden the fat. No bad results occurred in feeding cottonseed meal at the rate of 1 lb. for every 100 lbs. live weight for the 56-day feeding period. At slaughter, no symptoms of cottonseed-meal poisoning were found. The replacing of half the ration of rice bran during the last 8 weeks by an equal amount of corn was not sufficient to harden the fat formed. . . . The

finishing on corn and tankage for a period of 8 weeks of hogs fed previously on rice bran produced a quality of fat equal in every way to any corn finish. Rice bran and rice polish fed in equal parts for the entire feeding period of 16 weeks produced a fat somewhat inferior to the corn and tankage finish. . . . The addition of tankage to rice bran in a fattening ration had the tendency to increase softness and oiliness of the fat produced."

The average weekly gain and feed consumed per lot during the experiment are tabulated.

Pasturing alfalfa with hogs, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1916, pp. 19-21*).—Six pigs averaging 59 lbs. in weight were placed on one-fourth acre of Peruvian alfalfa February 9. The pasture was divided into two lots, allowing the pigs to be changed from one side to the other each week, and each pasture was irrigated every two weeks. Cracked dwarf milo maize at the rate of 2 lbs. per 100 lbs. live weight was fed as a supplement. On April 5 the hogs were turned on a half acre of Canada field peas and grazed on the peas and alfalfa for 14 days, during which they gained an average of 13.7 lbs. per head. They were then taken from the field peas and finished for 10 days on the alfalfa supplemented by a grain ration of about 4.5 per cent, and marketed on April 29 at an average weight of 121 lbs. each. During the 80 days they gained 1,818 lbs. per acre and required 1.98 lbs. of grain per pound of gain.

On June 20 a second lot of pigs averaging 71 lbs. each were placed on the same plats of alfalfa and fed a 2 per cent ration of cracked dwarf milo maize for 126 days. The hogs were then turned on a half-acre plat of dwarf milo maize in addition to the alfalfa and grazed for 21 days with no supplemental grain. At the end of the 147 days they averaged 191.6 lbs., during which period the gain per acre of alfalfa was 2,995 lbs. and the grain required per pound of gain was 3.48 lbs. Both lots had access to slaked coal, rock salt, and rock phosphate at all times. With pork at 7 cts. per pound and grain at 1 ct. per pound, the alfalfa pasture returned an income of \$196.65 per acre and furnished grazing for 24 head of hogs for the whole season.

Hog pastures for the Southern States, L. CARRIER and F. G. ASHBROOK (*U. S. Dept. Agr., Farmers' Bul. 951 (1918), pp. 20, figs. 4*).—In addition to notes on the value of green forage for hogs, grain rations for hogs on pasture, the carrying capacity of permanent and temporary pastures, the effect of grazing on soils, and fencing, directions are given for growing and hogging-off various forage crops suitable to southern conditions. Suggested cropping systems are outlined.

Pasture values for work horses, M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917, p. 12*).—Four work horses on night pasture during July, August, and September kept up weight in spite of heavy work and poor pasture. There was a daily saving of 10 lbs. of hay per horse due to the pasturage during the three months.

Breeds of light horses, H. H. REESE (*U. S. Dept. Agr., Farmers' Bul. 952 (1918), pp. 16, figs. 9*).—Information is given upon the origin, development, general appearance, and adaptability of the Arabian, Thoroughbred, Standard-bred, American Saddle, Morgan, Hackney, French Coach, German Coach, and Cleveland Bay breeds of horses.

Breeding horses for the United States Army, H. H. REESE (*U. S. Dept. Agr. Yearbook 1917, pp. 341-356, pls. 4*).—The results of experiments begun in 1913 by the U. S. Department of Agriculture in breeding light horses for the Army by the remount breeding plan are discussed in detail. For the purpose of encouraging farmers in producing more and better light horses the Government

is acquiring and placing in suitable localities stallions of proper conformation belonging to the Thoroughbred, American Saddle, Standardbred, and Morgan breeds.

In this breeding work 3,089 colts had been dropped up to June 30, 1917, and of the 451 3-year-old colts inspected by the War Department in 1917, 68 per cent were purchased by that department or retained by the owners as desirable animals. Of the colts rejected many were rejected on account of color and were for the most part excellent individuals. The advantages of the remount breeding work from the agricultural and military standpoints are pointed out.

[Poultry experiments], J. J. HOOPER (*Kentucky Sta. Rpt. 1917, pt. 1, pp. 27-29*).—In a test of range v. confinement for White Leghorn pullets those on free range produced more eggs and showed slightly less mortality than those confined. Cottonseed meal failed to replace successfully meat scrap in a dry mash mixture for laying hens. In repeating the test of rations high and low in lysin for young chicks (*E. S. R.*, 34, p. 871) it was found that considerable lysin is required during the first six months of growth, and that protein from animal sources is worth more than vegetable protein for chicks.

An egg laying contest embracing 30 pens of five pullets each was conducted from November 1, 1916, to October 31, 1917. The best record, 292 eggs, was made by a White Leghorn pullet, which laid 94 eggs in 94 consecutive days during the test. The best pen averaged 216 eggs during the contest year, and the average for the 150 hens was 162 eggs each.

Poultry project, M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917, pp. 14, 15*).—In a test of poultry as a commercial enterprise the stock is being kept in flocks of 100 and consists of White Leghorn and Rhode Island Red hens and pullets. They are fed farm-produced feeds for the most part. During the year ended November 1, 1916, the average egg production was 107 and the net returns \$2.17 per fowl, while for the following year the average egg production was 135 and the net returns \$2.33 per fowl. The cost of maintenance in 1916-17 was 47.6 per cent higher than in 1915-16.

A study of egg production in the White Leghorn.—Records of five laying contests, L. E. CARD (*Connecticut Storrs Sta. Bul. 91 (1917), pp. 39-90, figs. 12*).—A study of egg production records of the international egg-laying competitions at the Connecticut College during the five years ended October 29, 1917 (*E. S. R.*, 37, p. 368). The data used in the study include the first-year trap-nest records of 1,387 White Leghorns, the weekly pen consumption of dry mash, hard grain, grit, charcoal, and oyster shell, the daily weight of eggs produced by each pen, the weight of the individual birds, and meteorological data.

Egg production was found to be closely correlated with temperature, but apparently variation in barometric pressure exerts little if any direct effect on egg production. The mean annual egg production of these hens during the five years was 157.76 ± 0.77 , the standard deviation 42.33 ± 0.54 , and the coefficient of variability 26.83 ± 0.37 . In an effort to determine whether a method exists by which it is possible to pick out before the end of their pullet year those birds which are destined to lay less than 100 eggs, the material was grouped and studied in a number of different ways. A study of the average annual and monthly egg production of these birds, arbitrarily grouped on the basis of assumed egg production, shows that the best group for the year has the highest average for each month during the year; the poorest group for the year stands in the last place every month; and the other groups always hold the same relative positions. A further analysis of the data indicates however, that selection of individual birds on the basis of a single month's production will not give as clear-cut a division of the flock as is desired. Birds selected for high production during November, December, and January were all high producers, but the

group so selected contained only a few of the high producers of the whole population.

For the purpose of finding out what short period will give the most reliable indication of yearly egg production, a study was made of the records of the birds in the 1913-14 competition, and the results compared with the records of the other years. It was found that for the 327 birds in the 1913-14 group the correlation between egg production during the summer period, June, July, and August, and the total production for the year was 0.783 ± 0.014 . If these birds had been selected on the basis of an egg production of over 50 during these three months only 10 birds would have been lost that laid over 140 eggs and none that laid over 200. The correlation coefficient for summer production during each of the five years was considerably higher than the coefficients for the other three periods.

The practical application of results is set forth, and it is suggested that for best results in the locality studied Leghorns should be hatched in late April or early May. Summer culling is preferred to winter culling on the ground that poor layers if they lay at all will lay during the spring months, and therefore will have partially made up for the feed consumed during the winter. Further, for the poultryman who depends upon external signs of egg production as a basis of culling the summer period is by far the best time to cull the flock.

Cost of raising White Plymouth Rocks, A. G. PHILIPS (*Indiana Sta. Bul.* 214, pp. 3-23, figs. 7).—The work here reported involved 200 chicks in 1916 and 250 in 1917. These were for the most part White Plymouth Rock pullets, but some broilers, roasters, and capons were included in the study. The chicks were hatched and reared on the station farm under normal conditions, using a brooder stove colony house and permitting an abundance of range. The regular Purdue rations, involving those feeds which were quickly available to the average farmer, were fed.

The cost per chick at hatching time was 6.1 cts. in 1916 and 7.4 cts. in 1917. It required an average of two eggs to produce one chick each year. Two-lb. broilers at from 9 to 10 weeks of age required from 4.8 to 5.6 lbs. of grain and from 6.5 to 8.5 lbs. of skim milk at a total cost of 12 cts. It required from 27 to 30 lbs. of feed and 22 to 37 lbs. of skim milk at a cost of 58 to 84 cts. to produce a 28-week-old pullet. A 6.5-lb. roaster at 24 weeks of age had consumed from 24 to 27 lbs. of feed and 22 lbs. of skim milk at a cost of 53 to 75 cts. To produce a 9.5-lb. capon at 41 weeks of age required 64 to 67 lbs. of feed and 62 to 79 lbs. of skim milk at a cost of \$1.34 to \$1.88.

Cockerels grew more rapidly than pullets, though growth gains were very irregular from week to week. The cost of feed to produce 1 lb. of gain was directly proportional to the amount of feed consumed and at practically all times was less than the selling price. The cheapest costs were during the first 10 weeks of life. The gross costs for 1916 and 1917, respectively, were 24 and 29 cts. for 2-lb. broilers, 79 cts. and \$1.03 for pullets, 80 cts. and \$1.04 for 6.5-lb. roasters, and \$1.66 and \$2.32 for 9.5-lb. capons. The net cost of raising White Plymouth Rock pullets, allowing credit for all income from cockerels, was 43 cts. in 1916 and 70 cts. in 1917.

Factors in incubation, G. H. LAMSON, JR., and W. F. KIRKPATRICK (*Connecticut Storrs Sta. Bul.* 95 (1918), pp. 307-350, figs. 8).—This is a general treatise with the results of experimental data on the care and handling of eggs for hatching and the artificial incubation of eggs.

Of 1,124 Rhode Island Red eggs incubated, 71.1 per cent of the fertile eggs from 3 to 5 days' old and 63.5 per cent of those from 11 to 12 days' old hatched. In a study of the effects of ventilation and humidity, good hatches were secured in all cases where the carbon dioxid did not exceed 60 parts in

10,000. No marked decrease in the number of chicks hatched occurred until a maximum of 150 parts of carbon dioxide per 10,000 was reached. When the relative humidity of the incubator ranged between 30 and 60 per cent the percentage hatched of fertile eggs was not greatly affected. Relative humidity of from 15 to 20 per cent and of from 70 to 80 per cent considerably reduced the hatch. The time when the humidity was applied did not seem to have a great effect. Eggs giving the largest percentage of hatch lost from 10 to 11.5 per cent of their weight, due to evaporation.

The effect of subnormal temperature upon the chick embryo was also studied. It was found that chick embryos from virile stock will stand from 4 to 5 hours' exposure to a temperature of 50° F. after the first 24 hours of incubation, and from this point the time may be increased up to 15 hours for the tenth to twelfth day of incubation, but after the seventeenth day continued exposure to a temperature of 50° for more than 6 hours caused death to the embryos before the normal time for hatching. Cooling the eggs daily from the third to the eighteenth day of incubation reduced the hatch of fertile eggs 3 per cent. Eight per cent of the chicks hatched from eggs that had been cooled daily and 5.6 per cent from eggs that were not cooled died by the end of the fourth week. The percentage of fertile eggs hatched was from 5 to 6 higher when the eggs were turned twice daily than when they were turned five times at equal intervals.

National War Emergency Poultry Federation, H. R. LEWIS (*New Jersey Stas. Hints to Poultrymen*, 6 (1918), No. 9, pp. 4).—Notes are given on the history, organization, objects, and work already done by this organization.

DAIRY FARMING—DAIRYING.

[Feeding experiments with cows], J. M. SCOTT (*Florida Sta. Rpt. 1917*, pp. 21-26).—A comparison was made of cottonseed meal, peanut meal, and velvet bean meal for milk production. From November 11, 1916, to January 17, 1917, each of the cows in the test was fed 9 lbs. of wheat bran and 12 lbs. of corn silage daily, and in addition lot 1 was fed 3 lbs. of cottonseed meal; lot 2, 4 lbs. of peanut meal; and lot 3, 6 lbs. of velvet bean meal per head daily. Lot 1 produced 301.4 gal. of milk at a feed cost of 16.7 cts. per gallon, lot 2 produced 327.7 gal. at a feed cost of 15.5 cts. per gallon, and lot 3, 327.7 gal. at a feed cost of 16.5 cts. per gallon. Cottonseed meal was valued at \$50, bran \$40, peanut meal \$40, velvet bean meal \$32, and silage at \$4 a ton.

In a comparison by the reversal method of corn silage and sweet potato silage for milk production, seven cows on cottonseed meal, bran, and corn silage produced 917.3 gal. of milk at a feed cost of 11.3 cts. per gallon, while the seven cows on cottonseed meal, bran, and sweet potato silage produced 883.5 gal. of milk at a feed cost of 14.2 cts. per gallon. In this test corn silage was charged at \$4 and sweet potato silage at \$13.33 per ton. Analyses of the two silages are reported.

Winter feeding of heifers, M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa., 1917*, p. 13).—In order to learn what could be done with local farm-produced feeds for growing heifers, four animals from 8 to 14 months of age were fed from December 1, 1916, to June 1, 1917, all the hay they would eat, 5 lbs. of roots, and 2 lbs. of grain per head daily. During this period the 14-months calf gained 46 lbs., the 12-months calf 71 lbs., the 10-months calf 112 lbs., and the 8-months calf 152 lbs.

How the dairy cow brought prosperity in the wake of the boll weevil, L. A. HIGGINS (*U. S. Dept. Agr. Yearbook 1917*, pp. 303-310, pls. 2).—A brief account is given of the prosperity that has followed the adoption of dairying

in a section of southern Mississippi where the advent of the cotton boll weevil and other conditions had caused the whole region to face financial ruin. It is stated that "with the luxuriant growth of legumes and other forage crops, the long, mild seasons, the cheap production of heifer calves, the cattle tick now practically eradicated, and with excellent transportation facilities, southern Mississippi is rapidly becoming a great dairy center."

Butter fat and income, J. C. McDOWELL (*U. S. Dept. Agr. Yearbook 1917*, pp. 357-362, figs. 2).—Suggestions are given for the selection, breeding, and feeding of dairy cows for the purpose of increasing production. Tabulations of 5,587 cow-testing association records from various parts of the United States, covering a period of four years, show that as the milk fat production increased from 100 to 500 lbs. the income over cost of feed advanced from \$5 to \$118. These records, taken from 40 cow-testing associations, show further that the cost of roughage was about the same for all groups of cows regardless of production. The cost of grain was considerably higher for the more productive cows than for the low producers, but it was much lower per pound of milk fat.

The advantages of cooperative cow-testing and bull associations in the economical production of milk are set forth.

[Dairy herd records], J. M. SCOTT (*Florida Sta. Rpt. 1917*, pp. 17-21).—Tabulated records of the production of the station herd for the fiscal year ended June 30, 1917, are given. Of 32 cows in milk during this period the highest milk production record was 6,676.2 lbs. and the largest amount of milk fat was 837.44 lbs.

Variations in the fat, solids-not-fat, and total solids in cow's milk, G. C. WHITE and H. F. JUDKINS (*Connecticut Storrs Sta. Bul. 94 (1918)*, pp. 251-307, figs. 8).—The authors review the literature on the subject and report studies upon the variation in the fat and other solids in milk as shown by seven and a half year's examination of the milk of the station herd, involving 18 Jersey cows for a total of 45 lactation periods, 15 Guernseys for a total of 37 lactations, 7 Ayrshires for a total of 18 lactations, and 9 Holstein-Friesians for a total of 27 lactations. In this work the morning and evening milk of each cow at 10-day intervals was examined for fat by the Babcock test and for specific gravity by the Quevenne lactometer.

The following table shows the variations in fat and solids-not-fat of the milk of the cows of different breeds in the station herd:

Variations in fat and solids-not-fat in cow's milk.

Breed.	Number of animals.	Lactation periods.	Fat content.			Solids-not-fat content.		
			Low.	High.	Average.	Low.	High.	Average.
Jersey.....	18	45	<i>Per ct.</i> 4.25	<i>Per ct.</i> 6.49	<i>Per ct.</i> 5.32	<i>Per ct.</i> 8.34	<i>Per ct.</i> 9.68	<i>Per ct.</i> 9.07
Guernsey.....	15	37	4.07	4.92	4.49	8.39	9.61	8.92
Ayrshire.....	7	18	3.60	4.57	4.12	8.24	9.28	8.82
Holstein.....	9	27	2.75	3.93	3.41	7.89	8.94	8.33

Data from the station herd involving the records of 2 Ayrshires, 4 Jerseys, 5 Guernseys, and 3 Holstein-Friesians, milking through 45 lactation periods, show that the fat content ranged from 4.46 per cent in the first lactation period to 4.39 per cent in the second, and 4.22 per cent in the third lactation period. The solids-not-fat ranged from 8.93 in the first lactation period to 8.88 per cent in the second, and 8.85 per cent in the third lactation period. Tabulated data

from the Breed Advanced Registry records also indicate that mature cows on the average test lower in fat and solids-not-fat than immature cows. After the third lactation period it appears that the variation in fat and solids-not-fat is covered by more important factors.

Tabulated data of the records of 7 Holstein-Friesian cows through 12 lactation periods, and covering the first five 10-day testing periods, show that the average percentage of fat for the first testing period in each lactation was 3.7. The fat content decreased until at the fifth 10-day period the test averaged 3.15 per cent, whereas the average test for these cows during the complete lactation was 3.3 per cent. The solids-not-fat varied in a similar manner, starting at 8.79 per cent and in the fifth 10-day period showing an average of 8.51 per cent as compared with an average test of 8.6 per cent for these cows during the complete lactation period.

In reference to the effect of seasonal variation, data are tabulated and plotted showing the variations in milk solids for the cows in the station herd calving in the various months of the year for the entire seven and a half years' period. It has been noted that when breed is considered the percentages of solids-not-fat do not increase as fast as the fat. Apparently this does not hold true in the case of seasonal variation. For example, in the case of the 8 cows that calved in January the fat content of the milk dropped but 0.33 per cent from January to July, whereas the solids-not-fat dropped 0.6 per cent. The same thing is true in reference to the other winter calving cows. In the case of cows calving in May, June, July, and August, the fat test was considerably higher for the first month than for the second month of lactation. In general it is noted that the direction of the curves showing the variation in the percentage of fat and solids-not-fat is up, down, and up, as lactation advances, for winter-calving cows; down and up for summer-calving cows; and for fall-calving cows, gradually though slightly up and down. From these data and a further study of the milk of a Guernsey cow during short and long lactation periods it is concluded that the tendency for milk to test low in fat and solids-not-fat during the hot months is apparently greater than the tendency of prolonged lactation to raise the test.

Tabulated data for the year 1915 showing the monthly percentage of solids in the milk of an actual milking herd with each of the four dairy breeds, taken separately and collectively, indicate that there is a seasonal variation of both fat and solids-not-fat in the milk of all the breeds. In some instances the lactation stage helped to make this condition more pronounced.

From the results of this one year in this herd of an average of 21.8 cows it is seen that it is more difficult in the summer time to produce milk containing 8.5 per cent solids-not-fat than to produce milk which meets the legal fat requirement. For this herd the percentages of fat and solids-not-fat were very uniform during the cold months and also during the warm months. The average for the warm months was 0.31 per cent lower for the fat and 0.56 per cent lower for the solids-not-fat than for the cold months.

The relation of the results of this study to State and city milk standards is discussed. A list of the literature cited is included.

Some bacteriological tests of the milk clarifier, J. M. SHERMAN (*Jour. Dairy Sci.*, 1 (1917), No. 3, pp. 272-278).—The study here reported was undertaken to determine the merits of the milk clarifier from the standpoint of the high-grade milk producer. The milk used in the study was a grade equal to that of certified milk, though not licensed by a medical milk commission. Two milk clarifiers of standard type were used. Tests were made of the effect of the clarifying process on the number of bacteria, the subsequent activity of the organisms, and the keeping quality of the milk.

Samples were examined by the plate method for bacteria before and after clarifying. In 24 tests the milk before clarification contained from 1,860 to 11,400, with an average of 4,720 bacteria per cubic centimeter. The same milk after clarification contained from 3,160 to 13,800, with an average of 7,120 bacteria per cubic centimeter.

Reduction tests were made of the milks to ascertain the effect of clarification upon the subsequent activity of the bacteria. In eight such tests reduction took place sooner in the clarified than in the unclarified milk. The differences were well marked, and indicate that the clarifying process stimulates the activity of the organisms contained in the milk.

Tests were also made of the rate of acid formation in the milks by holding samples at 37° C. (98.6° F.) for 15 hours and then determining the amount of acid produced. Similar trials were made in which the milks were incubated at 10° for 10 days. In every case, at both temperatures, more acidity developed in the clarified than in the unclarified milk. The fresh milk used in this work was found always to contain udder streptococci morphologically identical with the streptococcus of mammitis. Of 15 samples of clarified milk tested for the presence of these organisms, streptococci were found in every case in apparently as great numbers as in the fresh milk.

The composition and market qualities of butter when corn silage is fed with cottonseed meal, L. S. PALMER and DURA P. CROCKETT (*Jour. Dairy Sci.*, 1 (1917), No. 3, pp. 235-245).—The authors report a further study in regard to the extent to which corn silage counteracts the effects which the feeding of cottonseed meal has upon the market qualities of butter (E. S. R., 37, p. 72). In the experiments, which lasted from November 5 to the following January 21, 12 cows were divided into two lots and fed during the basal periods a ration of corn silage, hay, and a grain mixture of corn meal, distillers' grains, and wheat bran. During the intervening periods a part of the grain mixture was replaced by 3 and 5 lbs. of cottonseed meal, respectively, and in addition the roughage of one of the lots was changed to hay only. Cream from the milk of the last three days of each period was churned in a semi-commercial way, that from each lot being handled in duplicate, and as soon as the butter was salted and worked samples were prepared for scoring and analysis, for a study of the keeping quality, and for a determination of the physical and chemical constants of the fat.

It was found that the feeding of the above amounts of cottonseed meal with corn silage caused as pronounced an oily flavor and as much increased hardness in the butter as when the same quantities of cottonseed meal were fed with hay alone. The market qualities of the butter were not impaired in either case. The use of corn silage as roughage tended to lower the melting point of butter which accompanies the feeding of cottonseed meal. The feeding of cottonseed meal both with corn silage and with hay materially increased the keeping qualities of the butter. The addition of cottonseed meal to a ration containing a liberal amount of corn silage has no effect upon the fat constants of the butter.

Concerning rancidity of butter, E. S. GUTHRIE (*Jour. Dairy Sci.*, 1 (1917), No. 3, pp. 218-234).—A brief discussion of what is meant by rancidity in butter is followed by a review of investigations upon the causes of rancidity and the measure for it. This is followed by a detailed report of a study of the chemical and enzymic factors involved in the development of rancidity. The chemical changes were studied with special reference to the iodine number.

In studying the effect of oxygen on milk fat, carbon-dioxid-free air was aspirated through samples of 32 per cent sterile cream. No rancidity was found in any of the samples and very little change took place in the fat constants.

A study was made of the effect of the development of enzymes in cream on the iodine number and on rancidity. In this experiment the growth of bacteria was held in check by chloroform. No rancidity developed in any of the 21 samples, which were uncontaminated at the end of the experiment. The average decrease in the iodine number was 1.3.

The effect of air, temperature, and diffused light on the iodine number of milk fat was studied with six samples of fresh milk fat, one division of which was held at 70° F. and the other at 90° for various periods up to 414 days. While marked decreases in iodine number occurred in some of the samples, the average decrease of the surface was 3.4, and of the bottom layers, 1.32. None of the samples developed rancidity.

One sample of old butter, which had been held at room temperature for 12 years in a glass fruit jar and frequently opened, was analyzed. The flavor was very strong, but not rancid. The iodine and Reichert-Meissl numbers were normal and the acid number 26.1. Another old sample of butter had been stored in a sealed tin can for 680 days. When opened this butter was somewhat rancid, but the rancidity disappeared in a few hours. The flavor was very tallowy. The constants of this butter were iodine number, 33.87; Reichert-Meissl number, 34.95; and acid number, 5.42. Held in an open bottle, a sample of this butter 87 days later had an iodine number of 32.05. No rancidity developed.

The author concludes that rancidity of butter, as defined by butter dealers and expert butter judges, is rarely found. The average person thinks of the strong flavor of butter as rancidity.

A bibliography is included.

A study of some factors concerned in the preparation of milk fermented with *Bacillus bulgaricus* and *Bacterium lactis acidii*, R. FINKELSTEIN (*Jour. Dairy Sci.*, 1 (1917), No. 3. pp. 250-258.—The effect of *B. bulgaricus* on ripened milk and skim milk at different temperatures was studied in an effort to find out the best practical method of preparing milk drinks with these lactic acid types of organisms, as well as to determine the behavior of different mixtures under varying treatments. Experiments were also made to test the effect of the addition of *B. bulgaricus* in different proportions on the flavor and body of buttermilk.

It was found that *B. bulgaricus* cultures partly lose with age their body and ropiness at temperatures ranging from 32 to 100° F. *B. lactis acidii* cultures, if not overripe at the start, have good keeping quality at temperatures ranging from 32 to 75°, but whey off readily at about 100°. Twenty-five per cent of *B. bulgaricus* culture added to the *B. lactis acidii* culture improves the flavor of the latter, gives it more body, and checks any tendency to wheying off, particularly so at 100°, or lower. If exposed at 100° for too long a period, the product becomes too acid and unpalatable. Mixed cultures of *B. bulgaricus* and *B. lactis acidii* in pasteurized whole milk have a superior flavor and a somewhat better keeping quality than those in skim milk. Twenty-five per cent of *B. bulgaricus* culture, added to the buttermilk obtained from pasteurized ripened cream, effectively checks its tendency to whey off, gives it a better body, and improves the flavor, which otherwise becomes old and flat.

Cheese making brings prosperity to farmers of southern mountains, C. F. DOANE and A. J. REED (*U. S. Dept. Agr. Yearbook 1917*, pp. 147-152, pls. 5, fig. 1).—A brief discussion of agricultural conditions in the southern mountain districts is followed by a description of the rapid growth of cooperative cheese making in that region. The first cooperative cheese factory was established in the spring of 1915, and in 1917 more than \$125,000 worth of cheese was manufactured in the 34 cooperative factories in the mountains of North Caro.

lina, Virginia, Tennessee, and West Virginia. It is estimated that about \$90,000 of this amount represents newly-created wealth.

VETERINARY MEDICINE.

Immunity and tissue transplantation.—II, The reactions occurring about tissue transplanted into homologous animals, M. S. FLEISHER (*Jour. Med. Research*, 38 (1918), No. 2, pp. 191-212).—The author has continued the investigations, previously noted (E. S. R., 38, p. 583), by observations on the effect of the transplantation of tissue into animals of the same species (homoio-transplantation). In the experiments reported, the technique of which was similar to that in the earlier experiments, guinea-pig kidney was transplanted into pockets in the subcutaneous tissue of the abdomen of guinea pigs after the animals had been immunized by intraperitoneal injections of emulsions of guinea-pig kidney, given four times at intervals of 48 hours. From the results obtained the following conclusions were drawn:

"Guinea-pig kidney, transplanted into guinea pigs immunized against guinea-pig kidney, grows and shows regeneration of tubules; and connective tissue and blood vessels invade the transplant. At the early stages after transplantation into immune animals, however, the connective tissue reaction about the transplant and the regeneration of tubules is not quite as marked as in normal animals. At later periods the regeneration and connective tissue reaction is the same in both. The most marked and constant difference between transplants in normal and immune animals is seen in the leucocytic reaction, which is slight in the normal animals and very much more marked in the immune animals. This difference between the leucocytic reaction persists only through the seventh or eighth day after transplantation. About the pieces transplanted into immunized animals are seen at first edema, and later edema and hemorrhages; a similar reaction is not seen about pieces in normal animals. It is possible that this is a local anaphylactic reaction similar to the Arthus phenomenon. These last two reactions—the leucocytic reaction and the local anaphylactic reaction—appear constantly in the immunized animals."

The precipitation of an organic colloid by human serum, normal or syphilitic, A. VERNES (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 14, pp. 575-578, figs. 2).—Experimental evidence is given to prove that it is possible to so regulate a colloidal suspension that it will produce a flocculation with syphilitic serum but not with normal serum. The colloidal suspension used was an alcoholic solution of the heart of a horse precipitated by dilution with water to which had been added from 0.3 to 0.4 per cent sodium chlorid.

Improvements in the technique of the concentration of antitoxic sera, ANNIE HOMER (*Jour. Hyg. [Cambridge]*, 17 (1918), No. 1, pp. 51-55).—The author describes a modification of the technique of the concentration of antitoxic sera previously noted (E. S. R., 36, p. 178). The principal changes are (1) the preliminary adjustment of the plasma to a hydrogen ion concentration of $p_H + 8$, which obviates the difficulties often experienced in the filtration of the hot plasma ammonium sulphate mixtures, (2) a shortening of the heating, making it possible to complete the two stages of the heating process within seven hours, (3) the precipitation of the second fraction by 46 instead of 50 per cent saturation with ammonium sulphate, thereby reducing the amount of heat-denatured albumin appearing in the final product, and (4) the recovery of a considerable portion of the antitoxin mechanically brought down in the first fraction by extraction with brine according to the Banzhaf-Gibson method,

using, however, the precipitates from a series of concentrations instead of from each separately, thereby saving time, labor, and materials.

The modified technique is described in detail.

Some proteolytic anaerobes isolated from septic wounds, HILDA HEMPEL (*Jour. Hyg. [Cambridge]*, 17 (1918), No. 1, pp. 13-19, figs. 2).—The author describes two proteolytic, anaerobic organisms derived from septic wounds. The first is a long bacillus with rounded ends, Gram-positive or negative, spore-forming, and feebly motile, resembling in its morphological characteristics *Bacillus sporogenes*. The second organism is a short bacillus with square ends, strongly Gram-positive, spore-forming, and nonmotile, and is probably the same organism as *B. bifermentans sporogenes*. Neither organism appears to be pathogenic to guinea pigs. The cultural characteristics of both are described in detail.

Paraffin paper as a surgical dressing, C. M. HARPSTER (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 23, p. 1763).—The author suggests the use of ordinary paraffin paper as a dressing for burns or for any other condition in which a nonadherent dressing is desirable. The various ointments now in use can be applied directly to the paraffin paper and this applied to the burned area after all vesicles have been opened. It has the advantages of excluding the air and of being readily removed at the time of redressing.

The disinfection of stables, G. W. POPE (*U. S. Dept. Agr., Farmers' Bul.* 954 (1918), pp. 12, figs. 6).—A revision of Farmers' Bulletin 480 (*E. S. R.*, 26, p. 578).

The sources of infection in food poisoning outbreaks, W. G. SAVAGE (*Jour. Hyg. [Cambridge]*, 17 (1918), No. 1, pp. 20-33).—The hypothesis thought to explain best the available facts suggests that the Gaertner-caused food-poisoning outbreaks are due to infection of the food with virulent Gaertner group organisms, derived either from animals which are at the time suffering from disease due to Gaertner group bacilli, or from animals acting as carriers of these bacilli. See a previous note (*E. S. R.*, 39, p. 389). The animal diseases caused by infection with members of this group, including swine fever, septicemia and other diseases of calves, pyemic and septicemic conditions in the domestic animals generally, enteritis in cows, abortion in mares, certain diseases of birds, canine distemper, and diseases among rodents, are considered.

A list of 41 references to the literature on the subject is appended.

The bactericidal action of arsenical compounds on experimentally produced streptococcic septicemias, C. S. ALLISON (*Jour. Med. Research*, 38 (1918), No. 1, pp. 55-67).—From investigations of the bactericidal action of salvarsan, diarsenol, and arsenobenzol, the author concludes that "they possess a distinct bactericidal power against virulent strains of streptococci 'in vitro,' in dilutions up to 1:3,000, and an inhibiting power over these organisms for at least 24 hours in weaker dilutions. They possess a bactericidal action against streptococci in the blood stream of experimental animals. The success of the treatment depends largely upon the virulence of the organisms, and upon reaching them before they become localized in some remote parts of the animal body. They produced no untoward effects on the animals where the maximum doses were frequently repeated. They possess a possible advantage over anti-streptococcic sera in that they do not destroy the bacterial cell and are, therefore, probably less liable to cause the sudden liberation of intracellular toxins. . . . It is possible that allied arsenical preparations may be found which will possess even greater value in the treatment of septicemias than the ones at present in use."

Hemorrhagic septicemia, H. J. WASHBURN (*U. S. Dept. Agr. Bul.* 674 (1918), pp. 9).—This bulletin deals with the characteristics, history, cause of the dis-

ease, symptoms, anatomical changes, diagnosis, prevention, treatment, and disinfection of premises.

Sulphur gas in the treatment of mange, LÉPINAY, VIGEL, and CHOLLET (*Rev. Path. Comp.*, 17 (1917), No. 137, pp. 233-254, figs. 10; *abs. in Vet. Rev.*, 2 (1918), No. 1, pp. 52, 53; *trans. in Amer. Jour. Vet. Med.*, 13 (1918), Nos. 5, pp. 213-217, figs. 2; 6, pp. 261-267, figs. 3).—Noted from another source (*E. S. R.*, 38, p. 82).

Experiments on the treatment of rinderpest with various drugs, W. H. BOYNTON (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 3, pp. 272-298, pl. 1).—Experiments are reported in which over 50 animals were treated with various drugs, but two recovering from the disease. This is considered sufficient proof that the drugs administered as they were had no curative power for an animal suffering from rinderpest.

Destruction of tetanus antitoxin by chemical agents, W. N. BERG and R. A. KELSER (*Jour. Agr. Research [U. S.]*, 13 (1918), No. 10, pp. 471-495, figs. 4).—The ultimate object of the investigation reported, made in the Bureau of Animal Industry of the U. S. Department of Agriculture, was a solution of the problem of the chemical nature of antitoxins and their preparation in a pure state. The immediate object was to decide whether an antitoxin is or is not identical with a serum protein. The method of procedure was to subject the antitoxin preparation to the action of artificial digestion reagents, and, by determinations of coagulable protein and amino nitrogen, to ascertain the extent of protein digestion, and, by inoculation tests, the amount of antitoxin remaining in the various mixtures. Anthrax serum was first studied, but as the results were inconclusive the principal work was confined to tetanus serum and tetanus antitoxin. These were exposed to the action of trypsin-sodium carbonate and pepsin-hydrochloric acid solutions for comparatively long periods of time. The extent to which digestion took place was then measured and the toxin remaining tested for by inoculation into guinea pigs.

It was found that tetanus antitoxin is completely destroyed in 0.5 per cent sodium carbonate solution and in 0.2 per cent hydrochloric acid solution. While no significant chemical changes in the proteins could be discovered in solutions amphoteric or faintly acid to litmus paper, trypsin destroys the antitoxin and at the same time the associated proteins are digested at substantially the same rate. The results were the same with solutions containing trypsin and 0.5 per cent sodium carbonate and with pepsin-hydrochloric acid. In neutral solutions pepsin does not affect the toxin.

"These results tend to indicate that tetanus antitoxin is a substance of non-protein nature. But the stability of the antitoxin is so dependent upon that of the protein to which it is attached, that whenever the protein molecule is split, the antitoxin splits with it."

The destruction of tetanus antitoxin by chemical agents, W. N. BERG and R. A. KELSER (*Proc. Nat. Acad. Sci.*, 4 (1918), No. 6, pp. 174-176).—This is a summary of the article noted above.

A monograph on trembles, or milk-sickness, and white snakeroot, F. A. WOLF, R. S. CURTIS, and B. F. KAUFF (*North Carolina Sta. Tech. Bul.* 15 (1918), pp. 5-74, pls. 10; *abs. in Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 7, pp. 820-827, figs. 2).—This is a report of investigations of trembles, which annually causes very considerable losses of horses, cattle, sheep, and hogs in the mountainous sections of all the counties of western North Carolina and in the immediately adjacent sections of States having similar conditions. An extensive review of the literature in connection with a bibliography of four pages is included. A preliminary report has been noted (*E. S. R.*, 37, p. 583).

The disease has been known to occur in North Carolina since 1810, the first claim that white snakeroot (*Eupatorium urticifolium* [ageratoides]) is the cause of the disease having been made as early as 1840. Of the 40 species of *Eupatorium* in the southern United States none but this species is known to be poisonous. The disease may appear at any season of the year but is most prevalent in late summer and autumn, especially when other vegetation is scarce because of drought. It is frequently fatal to domestic animals, while in man, in case of recovery, it results in lasting debility.

The present experiments were conducted at West Raleigh, about 400 miles distant from the place of collection of the white snakeroot used, where no cases of trembles or milk-sickness had ever appeared prior to the performance of these feeding tests. "During the experimentation, 31 fatal cases of trembles and milk-sickness have been developed among the 44 ewes and lambs that were employed in some phase of the experimentation involving the feeding of white snakeroot. Two of these lambs contracted genuine cases of milk-sickness by suckling their mothers, demonstrating that the disease may be transmitted through the milk. This fact has for a long time been a matter of common belief among farmers. Furthermore, animals in lactation, having access to white snakeroot may be apparently normal yet are capable of transmitting milk-sickness through their milk.

"There was no other contributory cause of death of these 31 animals except in the case of two individuals, in which cases stomach worms may have been, in part, responsible for death. One of the two hogs employed in the experiment developed a typical case of trembles. Fifteen of the 29 guinea pigs died from the feeding of white snakeroot or its products. It is not possible to determine with certainty whether death resulted from the feeding of butter in the case of two of the three mice employed, although it is logical, in view of the experiments with suckling lambs, to believe that the disease may be transmitted through the agency of butter. No evidence has been secured that the flesh of sheep dead of trembles is capable of transmitting the disease to dogs, although 11 carcasses were eaten by 7 dogs. Animals appear to differ greatly in their susceptibility to poisoning, since some became affected within a week after feeding on white snakeroot was begun, others only after several weeks, and a few remained unaffected."

The pathological changes found to accompany this disease are said to agree essentially with those described by Jordan and Harris in the paper previously noted (E. S. R., 21, p. 783). "No febrile condition is present in affected sheep. The most prominent changes noted in the 22 autopsies on sheep which were performed consist of albuminoid and fatty metamorphoses of the parenchymatous organs. The lesions commonly include petechiation of the epicardium; the presence of a metallic color of the kidneys, which exhibit active and passive congestion and cloudy swelling; a 'nutmeg' appearance of the liver which has undergone fatty changes, and is congested so that blood drips freely from the sectioned surface; the occurrence of mucoenteritis of the small intestine; and the presence of a congestive condition of the brain and meninges.

"All attempts to isolate a specific organism from the internal organs of 6 sheep, 1 hog, and 1 guinea pig were unsuccessful. This is supported indirectly by failure of diseased animals to communicate trembles to healthy ones when they are confined together and fed from the same trough. The active principle is probably glucosidal in nature. The sodium compounds, salt and soda, appear not to possess antidotal effects. In view of the grave cellular changes within the internal organs, there is little hope of the efficacy of medication with

domestic animals and preventive rather than curative measures are to be employed."

Note on the prevalence of bovine tuberculosis in the Punjab, G. TAYLOR (*Indian Jour. Med. Research*, 5 (1918), No. 3, pp. 497-509).—Results are reported of an examination of cattle in the Punjab during the years 1915 to 1917.

About 3 per cent of the animals selected for slaughter were found infected with tuberculosis. The lesions were practically all of a localized character, in all but two cases the disease being confined to the thoracic cavity and only in one case was there a generalized condition of the disease with affected udders. It is stated that, so far, practically all the cases of bovine tuberculosis in India have been confined to the northern Provinces.

Infectious abortion in cattle, L. F. RETTGER and G. C. WHITE (*Connecticut Storrs Sta. Bul.* 93 (1918), pp. 199-248).—This publication consists of an experimental study of infectious abortion in three dairy herds of from 60 to 100 animals each. Conclusions are based upon the results of agglutination and complement fixation tests, which are considered to be the only practical methods for routine diagnosis. Statistics are given of the percentage of infected animals in the herds, both young and old, the percentage of reacting milch cows, the duration of time in which the different cows continued to give positive reactions, the reaction of calves at birth and if negative at birth the time when the negative phase changed to a positive, the reactions of males, and the possibility of the transmission of infection through feed and through the agency of the male. From the above data the following conclusions were drawn:

"Heifers and young cows are more susceptible to infection than the older cows. Calves exhibit at birth the same reaction as their dams. After the sixth and up to the ninth or tenth month the calves are nonreactors and presumably free from infection. From the ninth or tenth month a period of unusual susceptibility to permanent infection is entered. It is during this period of the heifer's life, and up to three years of age, that the greatest effort is required to combat the spread of infection.

"Infection, as indicated by the serological tests, is relatively permanent in the adult animal. Bulls are subject to permanent infection, but the percentage of infection among the male is in all probability less than in the female. Young bulls follow the same course as the heifer calves, and may become permanent reactors from the time they are nine or ten months old.

"The percentage of reactors, in the present investigation, of the maturing heifers was practically the same for the calves which were born of positive mothers as for those which had no history whatever of infection. It appears quite probable that infection through the male as a passive carrier and through ingested feed constitutes the two most important modes of transmission of the disease."

Suggestions based upon the above facts are given for the prevention of the spread of infectious abortion in dairy herds. The authors have found methylene blue unsatisfactory as a cure for abortion. An appendix contains directions for the technique of the complement fixation and the macroscopic agglutination tests and a bibliography on the subject of abortion.

Contagious abortion (*Minnesota Sta., Rpt. Morris Substa.*, 1916, p. 23).—Successful checking of contagious abortion in the station herd at the Morris substation was brought about by the daily disinfection of the herd with a 2 per cent solution of coal-tar dip. All cows were irrigated after calving with a 0.01 per cent solution of potassium permanganate repeated daily until the discharge ceased. The herd bulls were disinfected with the permanganate solution before and after serving.

Bovine piroplasmosis in Panama.—A preliminary report, H. C. CLARK (*Proc. Med. Assoc. Isthmian Canal Zone*, 9 (1916), pt. 2, pp. 116-122).—In the present paper the author records the occurrence of bovine piroplasmosis in Panama, *Piroplasma bigeminum* having been first detected in the fall of 1916. Ticks taken from animals examined are said to represent *Margaropus australis*. The author's findings indicate that the disease is due not to an importation.

Contagious agalaxy of goats in Algeria, E. SERGENT and G. ROIG (*Bul. Soc. Path. Exot.*, 10 (1917), No. 7, pp. 575-585, figs. 2; abs. in *Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 8, pp. 1135, 1136).—This is a report of work at the Pasteur Institute of Algeria. It is stated that in an outbreak of contagious agalaxy of goats, observed in Algeria in 1908, 124 of 450 goats attacked succumbed within three months, it proving to be particularly fatal with the young.

"In the natural disease, mammary lesions always occur, lesions of the joints frequently occur, lesions of the eye have never been observed. Non-milking animals, therefore, only show lesions of the joints. In the experimental disease, lesions of the udder and joints are always present; lesions of the eye have been noticed in two cases out of 13. The disease was not transmitted by inoculation of the blood of infected animals; vaccination did not confer immunity. Inoculation with the milk (subcutaneously or in the peritoneum) produces the disease in goats without fail. Intraperitoneal inoculation does not affect either the guinea pig or the rat. The virus is not weakened by passage through the body. The ingestion of infected milk does not give the disease. One goat was infected by contact.

"In the epidemic studied a polymorphous bacterium of the Preisz-Nocard group was always found in the milk, never in the blood. Inoculation with cultures of this microorganism was not pathogenic. This bacterium is doubtless a proof of the invisible virus discovered by Celli and Dante de Biasi. It does not even appear to play the part filled by Carre's pyobacillus in Lure's disease. It simply appears to prove that the infection is caused by the specific virus."

Hog cholera globulin, R. GRAHAM (*Kentucky Sta. Rpt. 1916*, pt. 1, p. 43).—A series of tests was conducted to determine the efficacy of hog cholera globulin under field conditions as a preventive of hog cholera.

The results, including the treatment of 3,000 hogs under varying conditions of feeding and housing, indicate that the globulin fraction of hog cholera serum possesses immunizing properties equal to the whole unrefined hog cholera serum. It protects against natural exposure and artificial infection with from 1 to 5 cc. virus in doses of 0.2 cc. per pound weight.

Owing to its concentration, it may be used in smaller doses than unrefined serum, which reduces the labor of administration and renders absorption more rapid. It also possesses the advantage of being a sterile product.

Hog cholera; its economic importance and prevention, R. R. BIRCH (*Sci. Mo.*, 6 (1918), No. 5, pp. 450-457, fig. 1).—The importance of hog cholera control is emphasized.

Diseases of the horse, F. BRETON and E. LARIEUX (*Les Maladies du Cheval. Paris: Asselin & Houzeau, 1917*, 3. ed., rev. and enl., pp. XX+439).—A handbook presenting the elements of clinical veterinary medicine.

Bacillus paratyphoid equine, R. COMBES (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 14, pp. 572-575; abs. in *Vet. Rev.*, 2 (1918), No. 3, p. 303).—Tabulated results are reported of a study of the biological and cultural characteristics of the bacillus isolated from horses and mules affected with influenza and previously noted (E. S. R., 39, p. 392) as bacillus I. It has now been

named by the author *B. paratyphoid equine* from its close resemblance to the human paratyphoid bacillus.

The following method serves to differentiate the bacillus from paratyphoid A and B: On agar inoculated against the equine bacillus there is a growth of paratyphoid B, but not of paratyphoid A, or of the equine bacillus. On agar inoculated against the equine bacillus none of the three organisms grow, while on agar inoculated against paratyphoid A, there is growth of the equine bacillus and paratyphoid B, but not of paratyphoid A. A convenient method of distinguishing the equine bacillus from paratyphoid B is that the former does not blacken agar containing lead subacetate.

Equine influenza (equine typhoid) (*Vet. Rev.*, 2 (1918), No. 2, pp. 163-165).—A review of recent literature.

RURAL ENGINEERING.

Analyses of mineral and potable waters, A. M. PETER ET AL. (*Kentucky Sta. Rpts.* 1916, pt. 1, pp. 69-98; 1917, pt. 1, pp. 73-90).—These reports contain, respectively, analyses of 72 and 49 samples of potable and mineral waters from 31 and 29 counties in Kentucky.

Land-clearing trials, M. J. THOMPSON (*Minnesota Sta., Rpt. Duluth Substa.*, 1917, pp. 13, 14).—Pulling stumps from 12 to 15 in. in diameter before blasting saved dynamite and took no longer, and it is thought that on high land, with stumps having at least partly dead root systems, this plan is quite effective if properly carried out. A comparison of 20 and 30 per cent dynamite showed a cost per stump removed of 13.91 and 10.03 cts., respectively.

The design of public roads, C. H. MOOREFIELD (*U. S. Dept. Agr. Yearbook* 1917, pp. 265-281, figs. 4).—Factors to be considered in planning the improvement of public roads are discussed to show the variations in current practice and the influence of special conditions. Suggestions are offered as to the selection of surface type, widths, grades, and slopes on the basis of data presented in tabular form as to the design of a number of roads approved by the U. S. Department of Agriculture for construction under the Federal Aid Road Act.

Federal aid to highways, J. E. PENNYBACKER and L. E. BOYKIN (*U. S. Dept. Agr. Yearbook* 1917, pp. 127-138, fig. 1).—The operation of Federal Aid Road Act of 1916 is discussed and the procedure followed in its administration is outlined.

"On the whole, the Federal act now appears to be working smoothly, and cooperation with each of the 48 States along practical lines seems assured. Whether the application of the cooperative principle to this vast enterprise will produce the largest possible measure of benefit to the Nation can not yet be determined, but certainly if the difficulties of operation may be surmounted it should follow that the tremendous cumulative effort of all the forces of the Nation working to a common purpose should accomplish amazing results in the building of the Nation's highways."

The results of physical tests of road-building rock in 1916 and 1917, P. HUBBARD and F. H. JACKSON, JR. (*U. S. Dept. Agr. Bul.* 670 (1918), pp. 30, fig. 1).—This supersedes Bulletin 537 (*E. S. R.*, 37, p. 386), and supplements Bulletin 370 (*E. S. R.*, 35, p. 685), by reporting results of physical tests by the Office of Public Roads and Rural Engineering of 655 samples of road-building rock examined in 1916 and 1917. A complete record of all crushing-strength tests made by that office up to January 1, 1916, is included.

Public Roads (*U. S. Dept. Agr., Public Roads*, 1 (1918), No. 2, pp. 48, figs. 34).—This number contains data as to Federal aid road projects approved during March and April, 1918, and presents several articles and notes dealing

with various phases of road construction. Most of the articles discuss the effect of the increased traffic of heavy motor trucks upon the highways of the country. There is also a technical article entitled *The Commercial Sizes of Broken Stone Aggregates*, by F. H. JACKSON, JR., embodying a report of present practice in the New England and Middle Atlantic States.

Grain-dust explosions, B. W. DEDRICK, R. B. FEHR, and D. J. PRICE (*U. S. Dept. Agr. Bul. 681 (1918), pp. 54, pls. 4, figs. 5*).—Investigations carried on in the experimental attrition mill of the engineering experiment station of the Pennsylvania State College, in cooperation with the U. S. Department of Agriculture, are reported in tabular form and discussed in detail. A bibliography of the subject is given, including earlier work previously noted (*E. S. R.*, 32, p. 790; 35, p. 688). The final conclusions reached are summarized as follows:

"Every effort should be made to collect and remove the dust from the grinding mill and surrounding atmosphere. In some cases it may be advantageous to use inert gases to decrease the oxygen content and thus prevent the formation of an explosive mixture of air and dust. Every possible source of heat should be eliminated where there is any danger of having a dust-laden atmosphere. Every precaution should be taken to eliminate sparks due to static electricity.

"Greater use should be made of sheet iron on account of the very great danger from smoldering lumps of grain. Revolving dampers, as installed here and elsewhere, appear to be of some value as preventive measures for the propagation of explosions. The principle of the automatic relief valve should receive more attention as a possible remedy to apply for the partial prevention of the propagation of the flame."

A portable farm granary, L. M. JEFFERS, W. J. LARKIN, and A. L. RUSH (*U. S. Dept. Agr., Bur. Markets Doc. 11 (1918), pp. 8, figs. 6*).—Detailed plans and specifications are given for the first of a series of portable farm granaries, the granary described having been designed particularly for the wheat-producing areas of the Pacific Northwest.

RURAL ECONOMICS.

The agricultural situation and the food problem, C. L. HARLAN (*Atlantic, Ia.: News Publishing Co., 1918, pp. 17*).—The author concludes that in a social organization where there is an ever growing demand for food, there are two great handicaps to increased production. First, since income and not material production is the aim, this can be more easily obtained by means of a higher price for the present or even lessened production than through increased production at present or at lessened prices, and the fact that the acreage production in the best agricultural sections has not been increasing in spite of the continuous advance in prices indicates that this situation prevails. Second, that for a large and growing number of producers, even if increased production were assured of an increased return, this would be no marked incentive, for in the long run this increase would be largely appropriated by the landlord.

Food products report (*Rpt. Gov. Beeckman's Com. on Living Costs in R. I., 1917, pt. 2, pp. 21*).—This report discusses the increase in standard of living and wastage in the home, the fact that agricultural development has not kept pace with the rapid increase in population, and the absence of wholesale markets in large population centers which would eliminate a part of the disparity which ensues between production cost and retail prices. It also calls attention to the fact that wage increases have not kept up with price increases, and contains suggestions for an act establishing a food and market bureau.

Influence of a city on farming, J. H. ARNOLD and F. MONTGOMERY (*U. S. Dept. Agr. Bul. 678 (1918), pp. 24, figs. 5*).—This bulletin gives the result of a study of the agriculture of Jefferson County, Ky., as it is influenced by the city of Louisville.

It was found that in response to a favorable and increasing market for vegetables, an increasing area of land is being utilized for trucking. The raising of such crops as potatoes and onions has been profitable, principally on account of exceptional marketing facilities. The raising of cereals, while still important, has declined. The city offers an expanding market for dairy products, but by means of railways and trolleys, it is quickly and cheaply reached by dairy farms located a long distance out, where cheaper land and other favorable conditions enable the farmer to compete successfully in the dairy market. The old types of farms once dominant are disappearing and new types are organized to profit by the opportunities offered.

The most important conclusions drawn from this study are that for the area surveyed, the small farm intensely cultivated is the most efficient and profitable. The most profitable types are those specializing in potatoes and truck. The general mixed type of farming, representing extensive systems and a high degree of diversity, is the least profitable in the area.

A graphic summary of seasonal work on farm crops, O. E. BAKER, C. F. BROOKS, and R. G. HAINSWORTH (*U. S. Dept. Agr. Yearbook 1917, pp. 537-589, figs. 90*).—Supplementing an earlier bulletin (*E. S. R., 26, p. 532*), this article consists of maps and graphs of the United States, with explanations, showing the seasonal distribution of labor by 10-day periods on farms producing certain fruits, corn, wheat, and cotton, and the date of beginning of seeding, or planting, when it becomes general, when the harvest begins and when it ends, and similar seasonal operations on farms raising winter and spring wheat and oats, corn, cotton, Kafir corn, alfalfa, timothy and clover, potatoes, sugar beets, field beans, tobacco, peaches, apples, strawberries, and tomatoes.

Cost of horse labor on the farm, O. R. JOHNSON and R. M. GREEN (*Missouri Sta. Bul. 152 (1918), pp. 32, figs. 8*).—This information in regard to loss in handling horse labor on the farm was compiled from statistics gathered on from 6 to 24 farms in Missouri during a period of four years 1912 to 1915. The following are a few of the points brought out:

The average total yearly cost of keep per head of 75 farm work horses ranged from \$36.63 to \$95.85. Cost of feed made up about 72 per cent of the total cost of keep. Only 30 per cent of the farms which had the lowest feed cost fed oats, bushel for bushel or more, with corn, but indications in July, 1917, were that the ratio between the price of corn and of oats might be so changed that feeding oats to work stock would be an economical practice temporarily.

The horse was found to appreciate in value during the first four years of its life, but for the age of 5 to 6 years the depreciation is estimated at 7.3 per cent; at from 8 to 9 years, 2.1 per cent; at from 10 to 11 years, 12.8 per cent; and at from 11 to 12 years, 22.8 per cent. The actual depreciation of the whole herd is materially lessened by keeping a good proportion of young work stock.

The average annual amount of labor performed per horse was 1,127 hours in 1915 and the average total cost of horse labor per hour 7.7 cts. From the viewpoint of economy, experience seems to warrant the keeping of sufficient work stock so that each horse will average not more than 1,400 to 1,500 hours but not less than 800 hours of work per year. "The heaviest working of horses with the most liberal feeding or the lightest working with approximately a maintenance ration did not in general prove as economical from the viewpoint of horse labor cost as medium work on a moderate ration."

Value of records to the farmer, J. S. BALL (*U. S. Dept. Agr. Yearbook 1917*, pp. 153-167, fig. 1, pl. 1).—The author shows that even simple records are of practical value to the farmer when they are kept with a definite idea of the facts to be brought out. Suggestions and examples of records are given, the annual inventory of farm equipment and property and cost records being specially discussed.

Farm accounting, H. T. SCOVILL (*New York and London: D. Appleton & Co., 1918*, pp. XXII+429).—The author states that this book is intended to present the principles of bookkeeping, using a minimum number of rules. In applying these principles, the agricultural operations and transactions are presented in three general ways: Showing the financial condition of the farm and the progress it has made without indicating the source of loss or gain, showing the financial condition of the farm and the progress it has made and indicating by properly kept records why the condition is such, and showing the financial condition of the farm and the progress it has made, using subsidiary cost records for feed and labor, and so distributing other expenses as to show exact cost of production and thus indicating which branches of the farm operations pay and do not pay.

How to keep farm accounts, R. M. GREEN and D. C. WOOD (*Missouri Sta. Circ. 84 (1918)*, pp. 23).—The author recommends that the farmer establish nine main accounts, as follows: Stock account, crop account, real estate account, labor account, equipment account, general farm account, trading account, bills owed me account, and bills I owe account, and gives the forms and sample entries to illustrate the various accounts which he recommends.

Farm diary (*Yonkers-on-Hudson, N. Y.: World Book Co., 1918*, pp. VI+410).—This book is so arranged that the farmer may note each day the work performed by man and horse, and the amounts received and paid out. It also contains arrangements for summaries of the various farming operations.

Teamwork between the farmer and his agent, C. E. BASSETT (*U. S. Dept. Agr. Yearbook 1917*, pp. 321-325).—The causes of the antipathy of the farmer to the commission agent are discussed and remedies are suggested to increase the usefulness of the agent to the farmer. Teamwork between the two men is deemed essential to success. Five suggestions are made: (1) Know your agent, (2) know your market, (3) make regular shipments, (4) keep each other informed, and (5) avoid frequent changes in agents.

Cooperative marketing—where? when? how? C. E. BASSETT and O. B. JENNESS (*U. S. Dept. Agr. Yearbook 1917*, pp. 385-393).—Conditions necessary to a successful establishment of cooperative marketing are discussed. The authors warn of difficulties in organization and operation, and explain in detail the method to be pursued in undertaking a cooperative purchasing or marketing association.

Rural credit in the Philippines, M. CRETCHER (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 4*, pp. 306-314).—This article describes the activities of the Bureau of Agriculture in carrying out the provisions of the Philippine Island Rural Credit Act of 1915 and some of the problems involved.

Fourth annual report of the Hail Insurance Board of Alberta (*Hail Ins. Bd. Alberta, Ann. Rpt. 1917-18*, pp. 13).—This report contains the statements of the various officials connected with the board, together with the auditor's report, showing receipts and expenditures and acreage of crops damaged in 1917.

Rest rooms for women in marketing centers, ANNE M. EVANS (*U. S. Dept. Agr. Yearbook 1917*, pp. 217-224, pl. 1).—This article discusses various methods used to establish and finance suitable rest rooms, the kind of furnishings most practicable, the location, and methods to induce a greater number of patrons. With a matron, the rest room may be adapted to a large number of uses. Its

success is stated to depend largely on location and the feeling of right or interest in its facilities on the part of the country women.

The work of the Yuma Reclamation Project Experiment Farm in 1916, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1916, pp. 1-13, 31, 32, figs. 2*).—This portion of the report discusses the agricultural development and important features of progress of the sixth year (1916) of the Yuma Experiment Farm, near Bard, Cal. Tables give summaries of meteorological observations, irrigation development, yields and farm values of crops grown, acreage, production, and an inventory of live stock on hand at the close of each year for the period from 1911 to 1916, inclusive.

In 1916, 440 species, varieties, or strains of seeds and plants were received and tested, making a total of 1,739 during the past four years. About 110 of the 160 acres of land are now being used for experimental purposes. These experiments seem to show that the agriculture of this region can be stabilized by the production of cotton, alfalfa hay and seed, and grain sorghum, and by the establishment of certain live-stock industries. Work on animal and plant diseases and pests is also reported.

Report of the International Institute of Agriculture, LOUIS-DOP (*Rome: Internat. Inst. Agr., 1918, pp. 128*).—This report contains the history of the organization and its development, the program of work, administration functions, and results obtained in the past and during the war. See also an editorial note (*E. S. R., 38, p. 701*).

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 6, pp. 57-68, figs. 6*).—This number contains the usual data with reference to the acreage and condition of the principal crops, estimated farm value of important products May 15 and June 1, 1918, average prices received by producers in the United States, and range of prices of agricultural products at important markets. It also contains special reports with reference to the condition of Florida and California crops, the maple sugar and sirup production, 1918, report on early varieties of apples, the crop acreage contracted for canning, commercial acreage and production of strawberries, and the percentage of farmers planting tested seed and the percentage of germination. There is also a special article on the yearly variation in crop production.

AGRICULTURAL EDUCATION.

The status of the land-grant college as outlined in reports of surveys recently made by the U. S. Bureau of Education, S. P. CAPEN (*Ed. Rev., 56 (1918), No. 1, pp. 1-11*).—One of the purposes of the survey by the Bureau of Education in States in which the land-grant college is separate from the State university, it is stated, has been to determine the appropriate functions and relationships of these two institutions; that is, to devise a remedy for expensive duplication of courses and departments as distinguished from harmless necessary duplication. Solutions are suggested, including the application of the principle of major and service lines, for the disposition of the work in engineering which is considered the most critical question arising at the present time in connection with the distribution of the functions of these institutions.

List of workers in subjects pertaining to agriculture and home economics, 1917-18 (*U. S. Dept. Agr., List of Workers in U. S. Agr., 1918, pp. 68+89*).—This is the usual organization list of workers along these lines (*E. S. R., 36, p. 794*.) Part 1 deals with the U. S. Department of Agriculture, and part 2 with the agricultural colleges and experiment stations.

School and home gardening, K. C. DAVIS (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. XVIII+353, pl. 1, figs. 160*).—Part 1 of this text pre-

sents an outlook to gardening, i. e., beginnings and aims, and vacant lot gardening for villages and cities. Part 2 deals with garden operations and exercises, including chapters on the garden; garden tools and implements; hot beds and cold frames; plants in relation to soil, light, and air; home and school exercises; the soil and its improvement; irrigation and drainage; exercises with soils; garden plot experiments; beautifying home and school grounds; lessons with trees; cuttage, grafting, budding, and layering; indoor plants; the growing of vegetables; corn growing; garden calendar for Northern States; garden calendar for Southern States and insects, diseases, and their control. Part 3 was prepared for club leaders and teachers, and offers suggestions with reference to agricultural contests and club work, correlation with other school work and methods of teaching. A list of literature for gardeners is appended.

The child's food garden, V. E. KILPATRICK (*Yonkers-on-Hudson, N. Y.: World Book Co., 1918, pp. 64, figs. 46*).—This is the first volume in the school garden series edited by J. W. Ritchie. It approaches the subject of gardening from the standpoint of the child, and is intended for pupils in the third and higher grades. It consists of six parts, viz, the garden, vegetables, flowers, the seasons, preserving vegetables and fruits, and plant enemies and friends. Review questions, frost maps for spring and autumn, planting tables for common garden vegetables and flowering plants, and a canning and drying table are appended.

Illustrated lecture on the city and suburban vegetable garden, H. M. CONOLLY (*U. S. Dept. Agr., States Relat. Serv. Syllabus 33 (1918), pp. 20*).—This syllabus, which has been prepared in cooperation with the Office of Horticultural and Pomological Investigations of the Bureau of Plant Industry, is an adaptation of Farmers' Bulletin 936 (*E. S. R., 39, p. 139*) for the use of farmers' institute and other extension lecturers. A list of 50 lantern slides to illustrate the syllabus and a brief list of references to helpful literature are included.

Illustrated lecture on growing and handling Irish potatoes, W. STUART and H. B. HENDRICK (*U. S. Dept. Agr., States Relat. Serv. Syllabus 32 (1918), pp. 14*).—This syllabus, which has been prepared by cooperation between the Bureau of Plant Industry and this Service, is designed to aid farmers' institute and other extension lecturers in presenting this subject before popular audiences. It offers suggestions with reference to the growing and handling of potatoes as a truck crop and as a general farm crop, the preparation of the soil for planting, varieties to plant, potatoes for seed, planting, cultivation, spraying, and harvesting. A list of 42 lantern slides to illustrate the syllabus is appended.

Pig clubs and the swine industry, J. D. McVEAN (*U. S. Dept. Agr. Yearbook 1917, pp. 371-384, pls. 8*).—The author outlines the plan, management, and status of pig club work, and discusses its effects on the improvement of the swine industry in the introduction of better feeding methods and breeding stock, the fostering of community breeding, stimulating pork production and the home curing of meats, improvement of marketing methods, educational exhibits, and judging contests. The educational value of the club is also pointed out.

Home making.—Lessons for the seventh and eighth grades in the rural schools of Indiana (*Ind. State Dept. Pub. Instr. Bul. 31, 1917, Ser. A, pp. 16; B, pp. 9; C, pp. 10; D, pp. 12; E, pp. 8; 1918, Ser. F, pp. 8; G, pp. 13; H, pp. 11*).—This is a series of monthly bulletins which has been prepared to give practical help in somewhat detailed form in carrying out the course of study in home economics for the seventh and eighth grades of rural schools, as fixed by the State board of education in accordance with the requirements of the

Indiana Vocational Education Law. The bulletins in monthly sequence, beginning with September, deal respectively with food preservation, making use of our food supply, table service, the gift season, problems in hand sewing, home sewing, the farm house, and hospitality. The lessons consist of studies and practical problems.

Women's institutes (*Scot. Jour. Agr.*, 1 (1918), No. 1, pp. 46-51).—The objects which women's institutes seek to realize are briefly set forth, and brief accounts are given of the associations of farmers' wives in Poland, Belgium, the United States, Canada, Ireland, England, and Scotland.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1917 (*U. S. Dept. Agr. Yearbook 1917*, pp. 853, pls. 77, figs. 104).—This contains the report of the Secretary of Agriculture; a brief review of the work of the bureaus and offices of the Department in 1917; 35 special articles abstracted elsewhere in this issue; and an appendix containing a directory of the agricultural colleges and experiment stations and the State officials in charge of agricultural and extension work, and National and State live stock associations and allied organizations; and the usual statistics of the principal crops, farm animals and their products, the Federal meat inspection, estimated value of farm products, tonnage carried on railways, 1914-1916, imports and exports of agricultural products, rural and agricultural populations, number of persons engaged in agriculture and area of agricultural land in various countries, and the utilization of the National Forests.

Annual Report of Florida Station, 1917 (*Florida Sta. Rpt. 1917*, pp. 102+XI, figs. 15).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, a list of the publications of the year, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Twenty-ninth and Thirtieth Annual Reports of Kentucky Station, 1916 and 1917, Parts 1 (*Kentucky Sta. Rpts. 1916*, pt. 1, pp. [10]+106, pls. 5; 1917, pt. 1, pp. [10]+97, pls. 7).—These reports each contain the organization list, a report of the director on the work and publications of the station during the year, departmental reports, reports of analyses of mineral waters, and meteorological data, and, respectively, financial statistics for the fiscal years ended June 30, 1916, and June 30, 1917. The experimental work recorded is for the most part abstracted elsewhere in this issue. The 1916 report also contains the tribute to former Director J. H. Kastle previously noted (*E. S. R.*, 35, p. 709).

Report of Northeast Demonstration Farm and Experiment Station, Duluth, 1917 (*Minnesota Sta., Rpt. Duluth Substa., 1917*, pp. 15).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Reports of West Central substation, Morris, 1916 and 1917 (*Minnesota Sta., Rpts. Morris Substa., 1916*, pp. 24, figs. 3; 1917, pp. 40, figs. 12).—These are reports of the work for the respective years. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-ninth Annual Report of Texas Station, 1916 (*Texas Sta. Rpt. 1916*, pp. 31).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1916, and for various State funds for the fiscal year ended August 31, 1916, a report of the director on the work of the station and the various substations, and a list of the station publications available for distribution.

NOTES.

Arizona University and Station.—Dr. George F. Freeman, head of the department of plant breeding, has gone to Egypt where he will take up his permanent residence in Cairo in connection with the Société Sultanienné d'Agriculture.

Hawaiian Sugar Planters' Station.—A department of forestry and botany has been authorized, through which the station will undertake and supervise practical work to protect forest areas pertaining directly or indirectly to the water supply of sugar plantations. Fences will be constructed or repaired as the station is able to arrange with the landholders to do this, local nurseries will be established, and new trees planted wherever advisable.

This forestry work will be supplemental to that of the Territorial Board of Agriculture and Forestry, and it is expected that the two organizations will cooperate in many ways.

Kansas College and Station.—J. B. Fitch, associate professor of dairy husbandry, has been appointed head of the department, effective September 1. B. O. Severson, associate professor of animal husbandry and assistant animal husbandman at the Pennsylvania College and Station, has been appointed associate professor of animal husbandry and will have charge of animal breeding instruction and investigation. F. W. Bell, associate professor of animal husbandry in the Texas College, has been appointed associate professor of animal husbandry, to have charge of horse investigations, instruction in live stock judging, and the duties of secretary of the State Livestock Registry Board.

Minnesota University and Station.—During the serious October forest fires in northern Minnesota the auditorium, stock barn, and residence of the superintendent at the Duluth substation were destroyed. The forest experiment station at Cloquet narrowly escaped serious injury, but 1,200 acres of standing timber, upon which experiments had been in progress for several years, were not damaged.

The veterinary building at the college of agriculture has been remodeled, and a new laboratory built for the production of hog cholera serum.

R. A. Dutcher, assistant professor of agricultural biochemistry and assistant chemist, has been commissioned captain in the division of food and nutrition of the Sanitary Corps. Warren Williamson has resigned as instructor in entomology and assistant entomologist. Recent appointments include E. L. Proebsting as instructor in horticulture, W. J. Koppen as assistant in field horticulture, and F. W. McGinnis as instructor in farm crops.

Montana College and Station.—Dr. W. E. Joseph and R. C. McChord, assistant professors of animal husbandry, are now in military service. Miss Mildred Stewart, a 1918 graduate of the University of Wisconsin has been appointed assistant in chemistry.

Nebraska Station.—Owing to the scarcity of serum, the State antihog cholera serum plant, operated by the station, has been reopened with Dr. S. W. Alford as superintendent.

Cornell University.—Dr. E. D. Sanderson has been appointed professor of rural organization, this marking the beginning of definite provision at the institution for assistance in the social problems of country life. Homer C. Thompson, horticulturist in the Bureau of Plant Industry of the United States Department of Agriculture since 1913, has been appointed professor of vegetable gardening.

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No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Sanitary and applied chemistry, E. H. S. BAILEY (*New York: The Macmillan Co., 1917, 4. ed., rev., pp. 394*).—This edition, like the previous ones (E. S. R., 30, p. 695), treats of the chemistry which pertains to the daily life of the household. The chapters on purification of water supplies and sewage disposal have been brought down to date, and chapters on textiles and poisons and their antidotes have been added.

Contribution to the chemical study of the fruit of *Camelia drupifera*, BOUVELOT (*Bul. Écon. Indochine, n. ser., 21 (1918), No. 129, pp. 232-234*).—Analytical constants are given of the oil, press cake, and whole seed of *Camelia drupifera*. The oil obtained by pressing in the cold was limpid after filtration, very transparent, and of a golden yellow color and a sweet and agreeable taste and odor. Its chemical constants were as follows: Acid number in percentage of oleic acid 1.36, saponification number 194.48, iodine number 82.82, Reichert-Meissl number 0.22, and unsaponifiable insoluble fatty acids 98.79. The oil contained no alkaloid or cyanogen compounds but traces of the glucosid saponin.

The author considers that the oil would be suitable for soap making and, if the saponin were removed, would make an excellent table oil. The press cake could be used to advantage as a fertilizer, particularly as the saponin contained in it is toxic for the larvæ of insects.

Determination of the indigestible residue from wheat and its milling and baking products by the action of pancreatin in vitro, L. DEVILLEERS (*Compt. Rend. Acad. Sci. [Paris]. 166 (1918), No. 17. pp. 700-702*).—The method employed is as follows:

Five gm. of the product to be digested, 1 gm. of sodium borate, 0.3 gm. of crystallized calcium chlorid, 0.025 gm. of pancreatin (Defresne), and 100 cc. of distilled water are mixed and digested at 55° C. for three hours. The temperature is gradually raised to 70°, and then rapidly to 120° in the autoclave. The mixture is cooled to 55°, a second portion of 0.025 gm. of pancreatin added, and the digestion continued until a blue color with iodine is no longer produced. Sufficient hydrochloric acid is added to furnish 1.75 gm. of free acid per kilogram of the liquid. After standing an hour at 35 or 40° the mixture is filtered and the residue washed and weighed.

The following results are given of analyses according to this method, the indigestible matter being calculated as percentage of the product dried at from 105 to 110°: Wheat—Australian, 8.26; Plata, 9.06; Red Winter, 10.43;

dark hard, 10.66; and Manitoba, 11.43. Bran (thirds), 35.22. Flour (wheat and substitutes)—A, April, 1918, Paris, 8.17; B, April, 1918, Vincennes, 7.53. Bread—from flour A, 8.24; from flour B, 7.53.

Determination of the indigestible residue from wheat and its milling and baking products by the action of pancreatin *in vitro*, L. DEVILLERS (*Jour. Pharm. et Chim.*, 7. ser., 18 (1918), No. 1 pp. 5-17).—This is a more detailed description of the methods noted above.

A proximate analysis of the seed of the common pigweed, *Amaranthus retroflexus*, E. P. HARDING and W. A. EGGE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 529, 530; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1672).—Seeds of varying degrees of maturity were stripped from plants growing in Minnesota and were cleaned by removing foreign matter and chaff. The sample was rapidly ground to 20-mesh size and the moisture determined on a portion to represent the total moisture in the seeds. The rest was air-dried for seven days and then ground to a 72-mesh size. The analytical data are as follows:

Proximate analysis of pigweed seed.

Constituents.	20-mesh as received.	72-mesh air-dried.	Oven-dried.	Desiccator-dried.
	Per cent.	Per cent.	Per cent.	Per cent.
Moisture.....	11.23	8.60	.....	.....
Ash.....	4.33	4.46	4.88	.....
Oil (ether extract).....	7.03	7.24	7.92	8.46
Protein.....	18.57	19.13	20.93	.....
Starch (diastase).....	32.40	33.39	36.52	.....
Starch (acid conversion).....	39.77	40.98	44.83	.....

Effect of heat on the citric acid content of milk. Isolation of citric acid from milk, H. H. SOMMER and E. B. HART (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 313-318).—The citric acid content of milk and the effect of heat on this acid were investigated with the idea of correlating the results with the alleged production of scurvy or Barlow's disease in infants fed heated milk.

Citric acid was found to the extent of approximately 0.2 per cent of the milk, or 2 per cent of the milk solids. It was not destroyed in the heating of milk, even in the autoclave at 15 lbs. pressure for one hour. The citric acid salts of milk were not changed to an insoluble form on heating.

The properties and composition of oocytin, G. W. CLARK (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 253-262).—The author reports a more complete study of oocytin, which was prepared from blood by methods similar to those employed by Robertson (E. S. R., 26, p. 877). Tables are given of the elementary composition of the product and of its effects upon sea urchins' eggs. The following conclusions are drawn:

"The elementary analysis shows that oocytin, prepared as described, is not a chemical individual. Protein material is a constituent of oocytin. The products of hydrolysis of oocytin include purin bases (hypoxanthin) and a carbohydrate radical (pentose). Phosphoric acid is, however, only present in insignificant traces. Oocytin is neither hemolytic, bactericidal, nor identical with alexin. The active constituent is destroyed by heat at a temperature between 73 to 80° C., and by prolonged contact with alcohol. The fertilizing and cytolytic action of oocytin is attributed to the glucosidal structure of the nucleosids, which are probably the active constituents of the preparation."

A differential refractometer, G. A. SROOK (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 553, 554, figs. 2).—The instrument was devised for the purpose of measuring the difference in refractive index between two liquids. It

is of the Abbé type, but so constructed that two liquids may be examined simultaneously, and if the index of one is known and both have the same temperature coefficient the index of the other may be accurately determined without knowing its temperature. The instrument is shown diagrammatically and described in detail. It has been used by the author to measure the difference in index between hemolyzed and unhemolyzed blood, which depends upon the amount of hemoglobin present.

A new form of colorimeter, J. C. BOCK and S. R. BENEDICT (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 227-230, pls. 3; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1977).—The colorimeter described has been devised to replace those of the Duboscq type. The costly and difficultly obtainable prisms employed in the Duboscq and other instruments have been replaced by mirrors. The illuminating mirror, which is made by plating finely ground glass, prevents direct reflection of objects being visible in the reflecting mirrors, which are made by silvering ordinary microscope cover-slips. The standard solution is placed in a cell of known dimensions, thus obviating the use of a movable plunger. The unknown solution is placed in a movable cup reading from zero to a depth of 30 mm., allowing work with very small quantities. The manipulation of the instrument is described with illustrative diagrams.

The instrument in its present form is said to be adapted to nearly all colorimetric work and to give readings quite as sharp as those given by the best Duboscq instrument.

The acidimetry of colored solutions: An application of the pocket spectroscope, A. TINGLE (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 6, pp. 873-879; *abs. in Analyst*, 43 (1918), No. 508, p. 280).—The spectroscope is considered by the author to be an efficient means of distinguishing the exact neutral point in many acidimetric titrations in which the natural color of the solution masks the color of the indicator. The necessary concentration of most indicators is greater when they are to be used in connection with the spectroscope. The best conditions under which cochineal, methyl orange, lacmoid, phenolphthalein, rosolic acid, litmus, and hematoxylin can be used with the spectroscope are explained.

Abnormalities in the formol titration method, S. L. JODINI (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 7, pp. 1031-1035).—An interpretation is given of the abnormalities incident to the formol titration method, such as the yielding of accurate results in the case of such amino acids as contain in their molecule amino and carboxyl groups only, too low results in the case of amino acids which contain also the amino group, too high or too low results in the case of amino acids which contain other groups in addition to amino and carboxyl, and too low results in the case of diamino acids in which the distance of one amino group from the carboxyl plays a rôle as in lysin.

The inhibition of foaming, C. H. FISKE (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 411-413; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1977).—The factors involved in the inhibition of foaming are considered by the author to be high surface activity, high surface tension, high interfacial tension, low solubility, and low volatility. An efficient foam inhibitor complying with these conditions has been found in isoamyl isovalerate, or a mixture of this substance with isoamyl alcohol. Two methods of preparing this reagent are described.

A rapid pressure method for the determination of carbon dioxide in carbonates, W. H. CHAPIN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 527-529, fig. 1).—The principle of the method is as follows:

The carbonate is dissolved in dilute hydrochloric acid contained in a flask of known volume to which is attached a small mercury manometer. The change

in pressure is recorded, and by a simple calculation the weight and percentage of carbon dioxide are obtained.

The method of procedure is given in detail, together with a diagram of the apparatus. The accuracy is considered to be equal to that of the absorption method.

Reporting moisture results. H. A. NOYES (*Science, n. ser.*, 47 (1918), No. 1212, pp. 293-295, fig. 1).—Attention is called to the confusion resulting from the varying practice of soil chemists and physicists in reporting results of moisture determinations in soils. Various ways of stating the results to avoid this confusion are suggested, as follows: "(1) Ratio of water to 100 parts of dry soil, (2) parts of water with 100 parts of dry soil under conditions specified, (3) moisture with 100 parts of dry soil, and (4) grams moisture per 100 gm. of dry soil."

Determination of lime and phosphoric acid in peat soils: Comparison of Jönköping with Bremen method. C. O. ROST and F. C. CLAPP (*Soil Sci.*, 5 (1918), No. 3, pp. 213-218).—The authors at the Minnesota Experiment Station have compared two methods for the determination of lime and phosphoric acid in peat soils, viz, "the Bremen, in which the sample is incinerated and the ash extracted with aqua regia, and the Jönköping, in which an air-dry sample is extracted with 12 per cent hydrochloric acid. With the former larger amounts of iron and aluminum oxides, lime, and phosphoric acid are obtained, the difference with the first three constituents being small but that of the last very large. The smaller amount of lime found by the Jönköping method is due to part of that extracted being rendered insoluble in water in the course of the analysis and hence not included in the final precipitation. This unrecovered portion varies directly with the amount of iron present. Practically all of the phosphoric acid is recovered from the acid extract."

Aids in the commercial analysis of oils, fats, and their commercial products. C. F. PICKERING (*London: Charles Griffin & Co., Ltd.*, 1917, pp. VIII+133).—This laboratory handbook describes commercial methods for the sampling and preparation for analysis of oils and fats and for their chemical examination. Special sections are devoted to the discussion and interpretation of analytical results obtained with commercial fatty oils, miscible castor oil, blown oils, sulphonated oils, neutral fats, fat splitting and distillation products, glycerin resins, and recovered products and their distillation products. Many tables are given of analytical data published for the first time. The limiting values of the tests for the oils, fats, and waxes of the British Pharmacopœia are appended.

A modified acetic acid reagent for Valenta tests. A. E. PARKES (*Analyst*, 43 (1918), No. 504, pp. 82-86, fig. 1).—To obviate the difficulties often caused by the solidification of acetic acid during cold weather, the author suggests as a substitute reagent for the Valenta test a mixture of acetic acid of 99 per cent purity with about 10 per cent of propionic or butyric acid. To this is added water in small quantities (1 to 2 per cent is generally necessary) until the reagent gives the turbidity temperature required, using butter fat or other convenient fat or oil as a standard, or until it gives the same figure as pure acetic acid of some definite strength, preferably 99 per cent.

Note on the acidity of castor oil of Indo-Chinese manufacture. ROSÉ (*Bul. Econ. Indochine, n. ser.*, 20 (1917), No. 127, pp. 643-648).—As the castor oil which is used as a lubricant for aviation motors must be absolutely limpid and possess an acidity in oleic acid not exceeding 15 gm. per liter, investigations were conducted for the purpose of ascertaining the conditions under which such an oil could be prepared. Determinations of free acid in different samples of

the oil showed that the acidity increases on standing unless the oil is heated to 95° C. for about 10 minutes. This would indicate that increasing acidity is due to the action of enzymes in the oil which are destroyed by heat. If the heating of the oil is followed by immediate filtration, an oil of the necessary standard of limpidity and acidity is easily obtained.

The determination of essential oils in nonalcoholic flavoring extracts. F. M. BOYLES (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 537-539; *abs. in Chem. Abs.*, 12 (1918), No. 16, pp. 1669, 1670).—The method which the author has found most satisfactory for the determination of the essential oil in lemon, orange, and certain other extracts consists of making an alcoholic extract from the emulsion and proceeding according to the official method.¹ This method proved unsatisfactory with peppermint extract, but distillation with steam gave very good results. In the use of this method it is necessary to make a preliminary determination of the percentage of oil which can be recovered with the apparatus in blank experiments, using known quantities of pure oil.

The detection and determination of coumarin in factitious vanilla extracts, H. J. WICHMANN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 535-537; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1669).—A qualitative test for the detection of coumarin in vanillin extracts is described which can be conducted easily in 15 minutes, takes only 10 cc. of extract, and does not require dealcoholization or the use of complicated apparatus.

The method is based upon the change of coumarin to salts of coumaric acid by hot concentrated potassium hydroxid with the development of a yellow color. The sudden disappearance of the color indicates the conversion of the salt into a colorless salicylate. The method is described in detail, together with a gravimetric method for the quantitative determination of coumarin.

Practical laboratory apparatus—filtering rack for sugar solutions, C. W. HINES (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 434, 435, fig. 1).—The filtering rack described by the author was devised to obviate the delay in obtaining a clear filtrate in the preparation of sugar samples for polarimetric work. The apparatus consists of a double filtering rack, each compartment containing a double row of holes. Beneath the back row of holes in both front and rear racks are placed small pans or troughs of galvanized iron which receive the first filtrate which passes. After the clear liquid has begun to pass through, the funnels are moved to the front row of holes and placed above clean beakers to receive the filtrate for polarization.

A simple salt test, F. W. BOUSKA (*Jour. Dairy Sci.*, 1 (1917), No. 3, pp. 279-283).—A method of standardizing the silver nitrate solution for the determination of salt in butter is proposed. Briefly, the method is as follows: Dissolve 1 gm. of butter salt in exactly 0.5 pint of distilled water, place 9 cc. of this salt solution in a convenient container, and add enough potassium or sodium chromatic solution to give a yellow color. Use an excessively strong preliminary silver nitrate solution, and dilute with the distilled water until it takes exactly 10 cc. of silver to titrate the salt solution to a brick-red color.

In the salt determination dissolve 10 gm. of a homogeneous sample of butter in 0.5 pint of hot distilled water, draw out 9 cc. of this mixture by means of a pipette before the fat has risen to the top, and titrate with the standardized silver solution to a brick-red color. The percentage of salt is read directly from the burette. The salt test residues should be carefully saved and the accumulated silver chlorid recovered and sold.

¹ *Jour. Assoc. Off. Agr. Chem.*, 2 (1916), No. 3, p. 262.

The identification of the cinchona alkaloids by optical-crystallographic measurements, E. T. WHERRY and E. YANOVSKY (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 7, pp. 1063-1074, figs. 8).—The application of the optical-crystallographic method (E. S. R., 39, p. 415) to the cinchona alkaloids is described, and the properties of the cinchona alkaloids—cinchonin, cinchonidin, quinin, and quinidin—are presented in descriptions and in tabular form. Tables are given by following which the identity of an unknown alkaloid in the group can be readily ascertained. The results obtained with mixtures are described, and the method of treatment of a medicinal preparation containing these substances is outlined.

The analysis of dyestuffs and their identification in dyed and colored materials, lake-pigments, foodstuffs, etc., A. G. GREEN (*London: Charles Griffin & Co., Ltd.*, 1916, 2. ed., pp. IX+144, figs. 3).—The methods of analysis are for the most part the revised and completed results of a series of investigations conducted by the author, with the assistance of various collaborators, during the past 20 years. The volume also includes a short theoretical introduction, especially from the standpoint of dyestuff classification, and a chapter on the constitution of azo dyestuffs.

Uniform nitrogen determination in cottonseed meal, J. S. MCHARGUE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 533-535; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1671).—As a result of investigations regarding the cause of lack of uniformity in the results of nitrogen determinations on cottonseed meal, the following conclusions are drawn:

"The chief source of irregularity in nitrogen determinations on cottonseed meal may be due to a lack of grinding the sample to a sufficient degree of fineness (40 mesh) to obtain a homogeneous mixture of hulls and meal for weighing out a charge. When mercury is used as the catalyst a digestion period of more than two hours of brisk boiling in an excess of sulphuric acid apparently causes a loss of nitrogen. When copper sulphate is used as the catalyst the digestion period will depend upon the amount of sodium sulphate added, 12 gm. being sufficient to bring about a complete digestion in two hours. The precipitation of the copper as sulphid facilitates the boiling and shortens the time of distillation. Sodium sulphate is as efficient as potassium sulphate in cottonseed meal digestions. The writer suggests the use of the following charge: 0.7005 gm. of cottonseed meal, 0.3 gm. CuSO_4 or 0.5 gm. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 12 gm. $\text{Na}_2\text{SO}_4 + 25$ cc. H_2SO_4 , and brisk boiling for two hours."

Determination of acetic acid by distillation with phosphoric acid, W. F. MUNN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 550-552, fig. 1).—The method described is a modification of the regular phosphoric acid distillation process. The principle of the method is the decomposition of the acetate by means of phosphoric acid, distillation of the acid vapors liberated, and their collection in a known amount of a standard barium hydroxid solution which is then titrated back with standard acid.

The method has been used by the author particularly for determining acetic acid in calcium acetate residues and dry soda and sulphite liquors and is said to have given in all cases excellent results.

Alkalinity and acidimetry of chlorinated solutions utilized in surgery. Determination of free alkalis and of alkaline carbonates and bicarbonates, W. MESTREZAT (*Jour. Pharm. et Chim.*, 7. ser., 17 (1918), No. 8, pp. 259-266, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 17, p. 1787).—It is suggested that the difficulty in determining the alkalinity or acidity of chlorinated solutions on account of the action of chlorine on the indicators employed may be overcome by the addition of sufficient 20 per cent hyposulphite solution to combine with the

chlorin. The alkaline or acid reaction of the solution is not appreciably modified, but the use of litmus and phenolphthalein is rendered possible. By combining the results furnished with these indicators in the cold in two successive titrations the amounts of free alkalis, of alkaline carbonates, and of bicarbonates may be determined.

The technique of the method is described in detail.

Determination of chlorin in the presence of organic matter (gastric juice, fresh blood and blood serum, and milk), SMOR and JORET (*Ann. Chim. Analyt.*, 23 (1918), No. 5, pp. 109-113; *abs. in Analyst*, 43 (1918), No. 508, pp. 274, 275; *Chem. Abs.*, 12 (1918), No. 17, pp. 1786, 1787).—A comparison is reported of the results obtained in the determination of chlorin in organic substances by the usual method of ashing the sample with those obtained by simple coagulation of the organic matter by an appropriate reagent. Picric acid was used as a precipitant for gastric juice, sodium metaphosphate for blood and blood serum, and aceto-picric acid for milk. The results obtained by the two methods were similar in all cases, showing that the preliminary ashing is unnecessary.

A rapid method for the determination of iron in small quantities of blood, L. BERMAN (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 231-236; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1977).—In the method described the iron held in combination in fluid blood is split off by the action of concentrated hydrobromic acid and oxidized by potassium permanganate which also destroys the organic matter. The resultant solution is mixed with a solution of ammonium sulphocyanate in water and acetone, and the color is compared with that of a standard iron solution similarly treated. The details of the method are as follows:

To 0.04 cc. of blood, obtained by pricking the finger or ear lobe and measured in a calibrated pipette, 2 cc. of water. 0.2 cc. of $\frac{N}{10}$ hydrochloric acid, and 2 cc. of $\frac{N}{10}$ potassium permanganate are added. The mixture is placed on a water bath for about 2 minutes, when a brownish-red coagulum is formed above a colorless or slightly yellow fluid. Two drops of concentrated hydrobromic acid is added and the tube heated on the water bath for another 2 minutes. The solution is filtered through acid-washed filter paper into a long narrow graduate. Washings are added until the filtrate has reached the 5 cc. mark, when 5N ammonium sulphocyanate is added to the 10 cc. and acetone up to 20 cc. The graduate is stoppered, the fluids are mixed, and acetone is again added to make up for the shrinkage in volume.

The standard is prepared by adding 2 drops of concentrated hydrobromic acid to 2 cc. of standard iron solution containing 0.009 mg. of iron per cubic centimeter, heating on a water bath for from 2 to 4 minutes, and then adding water, ammonium sulphocyanate, and acetone as in the sample. After both graduates have stood for 5 minutes, comparison is made in a Duboscq colorimeter.

The process is said to be rapid and accurate.

The preparation and testing of pure arsenious oxid, R. M. CHAPIN (*Jour. indus. and Engin. Chem.*, 10 (1918), No. 7, pp. 522-525).—The ordinary purity tests for arsenious oxid, with certain modifications, are described. Two additional tests are included, a test for heavy metals and one for antimonious oxid.

For the former a solution of the sample prepared by dissolving 1 gm. of the powdered substance in 10 cc. of ammonium hydroxid (1 volume of ammonia—sp. gr. 0.9—to 2 volumes of water) is mixed with fresh saturated hydrogen sulphid water and heated. No precipitate, turbidity, or color other than a faint yellow should appear.

To test for antimonious oxid, the solution of the sample prepared as above is cooled in a test tube in ice water for 15 minutes. A turbidity indicates the presence of antimonious oxid. As small an amount as 0.15 per cent can be detected by this test.

A method of preparation of pure arsenious oxid by fractional crystallization is described in detail.

Some qualitative and quantitative tests for arsphenamin and neoarsphenamin, C. N. MYERS and A. G. DUMEZ (*Pub. Health Rpts. [U. S.], 33 (1918), No. 25, pp. 1003-1018*).—This article gives a description of qualitative tests for arsphenamin (salvarsan) and neoarsphenamin (neosalvarsan) and a critical discussion of various quantitative methods for the determination of arsenic in the above and other organic compounds.

A contribution to the composition of lime-sulphur solutions, O. B. WINTER (*Jour. Indus. and Engin. Chem., 10 (1918), No. 7, pp. 539-545*).—The literature on the subject of the composition of lime-sulphur solutions is reviewed and discussed, particularly the work of Thompson and Whittier previously noted (*E. S. R., 32, p. 410*). Investigations conducted by the author at the Michigan Experiment Station are reported leading to the following summary:

"Compounds containing the (SH) radical, as hydrogen sulphid, calcium hydrosulphid, calcium hydroxyhydrosulphid, and the corresponding salts of other metals, may be detected in a lime-sulphur solution by comparing the titration of the solution with standard iodine to the disappearance of the yellow color with that when the end-point is determined by the use of nitroprussid of sodium. A 'straight' lime-sulphur solution does not contain an appreciable amount of any of the above-mentioned compounds. The difference between the titrations of a straight lime-sulphur solution with standard hydrochloric acid and standard ammoniacal zinc chlorid is a measure of the free lime in the solution. When an excess of lime is used in the preparation of a lime-sulphur solution and the solution is freshly prepared, or when recently diluted with limewater, it contains free lime; but, on standing, the free lime gradually disappears. Therefore an ordinary lime-sulphur solution can not contain free lime.

"When magnesium sulphate is added to a lime-sulphur solution the following may be noted: (1) There is a slight decrease in the monosulphid sulphur and the sulphid sulphur contents. (2) The thiosulphate sulphur content remains practically constant. (3) The magnesium replaces part of the calcium forming magnesium polysulphid, and under proper conditions calcium sulphate crystallizes out. (4) A compound containing the (SH) radical is formed.

"The magnesium sulphate method for determining free lime in a lime-sulphur solution is inaccurate. There appears to be no free sulphur in a lime-sulphur solution, and the sulphur that separates out on standing undoubtedly comes from the higher polysulphids. When a concentrated lime-sulphur solution is prepared with an excess of lime, orange-red needles separate out. The properties of these crystals indicate that they are the same as those described in the literature as Herschel's crystals and as being composed of calcium oxid combined with calcium polysulphid. Their analysis agrees most closely with that of Geuther, who gives for their formula the following: $2\text{CaO} \cdot \text{CaS}_3 \cdot 11\text{H}_2\text{O}$. However, it seems improbable that they exist in solution in the form indicated by this formula."

A process for deodorizing fatty oils, W. P. SCHUCK (*Metallurg. and Chem. Engin., 18 (1918), No. 11, pp. 608, 609*).—The method consists of blowing hydrogen through the heated oil in the same manner as in the hydrogenation of oils, except that no catalyzer is present. The oil is not hardened but is rendered odorless and palatable. It is considered that the means whereby the deodori-

zation is accomplished by this process are both physical and chemical. The iodine number is lowered somewhat, showing that partial hydrogenation has taken place. Oils so treated are said to have much better keeping qualities than steam-deodorized oil. Among the commercial possibilities of the process are the purification of fish oils and of fats which have been burned from continued use in cooking, and the removal of taste and odor from medicinal castor oil.

It is stated that the use of the process as described in this article is protected by U. S. Patent No. 1,260,072.

Investigations on the sulphitation process, F. W. ZERBAN (*Louisiana Stas. Rpt. 1917, pp. 9, 10*).—This is a continuation of the study of decolorizers in sugar purification previously noted (*E. S. R.*, 37, p. 806).

It was found that natural vegetable substances, in order to furnish highly active carbons, should either contain large amounts of infusion ash or else should first be impregnated with such or similar substances to serve as a skeleton on which the carbon particles are deposited in a finely divided state. The decolorizing effect of the resulting carbon appears only after the impregnating substances have been removed by means of suitable solvents. Active carbons from natural sources have been prepared by charring the highly silicious parts of certain grasses, heating the char to high temperatures in the absence of air, and dissolving out the silica by boiling with caustic soda, preferably under pressure.

In the artificial impregnation methods, highly active carbons were made from ordinary pine or other sawdusts by charring them in a mixture with lime, acetate of lime, etc., and then using hydrochloric acid to remove the impregnating substance after thorough carbonization. Zinc chlorid and stannous chlorid were efficient impregnating substances, but the best carbon was made with anhydrous magnesium chlorid.

A study of the deterioration of sugars and principal factors affecting same, W. L. OWEN (*Louisiana Stas. Rpt. 1917, pp. 10-12*).—This is a continuation of work previously noted (*E. S. R.*, 37, p. 509).

Observations upon the changes in chemical composition of sugar samples showed that a solid nonsucrose moisture ratio of 3:1 (known as the factor of safety) does not invariably prevent a sugar from deteriorating, and that there is a successive increase and decrease in reducing sugars of the same sample at different periods of storage. A wide variation in the power of different organisms to destroy sucrose was obtained. The limit of sucrose concentration in which the cultures seem capable of inducing appreciable action is between 45 and 55° Brix. The low maximum density in which these bacteria are capable of developing suggests that their deteriorative action is largely confined to fairly moist sugars in which the molasses films have been diluted by the absorption of moisture. If the moisture content of the sugar is normal no deterioration results.

By the use of sucrose media of high concentration 17 species of torula were isolated. These organisms, however, had only a slight destructive action on sucrose, levulose, or dextrose. The most important causative agents in deterioration were the fungi, principally *Aspergilli*, which have a very destructive effect even at a high concentration of sugar. The limit of density at which fungi are capable of rapid deterioration is 69° Brix, torula 64°, and bacteria 52°. The addition of nitrogen and ash nutrients does not markedly increase the activity of torula or bacteria or have much effect on the keeping qualities of sugar. The addition of such impurities as compounds of calcium reduces the activity of the microorganisms because of the effect upon the density of the solution.

In applying the results of these investigations to actual practice the importance of maintaining the composition of the molasses film is emphasized. Dry and cold storage is specially necessary in preventing deterioration. Little benefit results from the practice of disinfecting sacks.

The deterioration of cane sugars in storage; its causes and suggested measures for its control, W. L. OWEN (*Louisiana Stas. Bul.* 162 (1918), pp. 121).—This bulletin is a complete report of the author's investigations during the past nine years on sugar deterioration, preliminary reports of which have been noted (see p. 509). The subject is discussed under the following topics: Observations upon the changes in the chemical composition of sugar samples in storage, the microorganisms constituting the causative agencies in the changes in the composition of sugars in storage, the influence of the density of the molasses film upon the deterioration of sugars, and the practical application of the results of the investigation to the conditions existing in the cane-sugar industry.

A bibliography of 36 titles is appended.

Manufacturing sorghum sirup, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 7, pp. 213, 214).—Suggestions are given for handling the cane juice and finished product on a small and on a large scale.

Starch from flowering tubers, P. E. VERKADE (*Chem. Weekbl.*, 15 (1918), No. 14, pp. 427-434, figs. 3; *abs. in Chem. Abs.*, 12 (1918), No. 15, p. 1602).—This article discusses the possibilities in the use of materials other than grain for the manufacture of starch. The materials considered by the author to be the most practical for use in Holland are the tubers of the tulip, hyacinth, and narcissus. Individual characteristics of the starch obtained from these sources are described and diagrams are given of their microscopic crystalline forms.

German substitute for jute (*Agr. Jour. India*, 12 (1917), No. 2, pp. 322-326; *abs. in Nature [London]*, 99 (1917), No. 2493, p. 470).—Materials used in Germany to replace jute fiber in the manufacture of sacks and coarse textiles are briefly discussed. Waste paper and cellulose, previously noted (*E. S. R.*, 38, p. 208), are described as war-time substitutes only, but *Epilobium hirsutum* and Typha fiber, which are said to have been developed on a commercial basis, are regarded more seriously. The claim is made that the successful production of Typha fiber will render Germany independent of importations of cotton, jute, and wool.

A chemical process of peeling peaches, C. C. NEWMAN and B. FREEMAN (*South Carolina Sta. Bul.* 196 (1918), pp. 8, figs. 5).—The process consists of dipping the unwashed fruit in a 3 per cent solution of caustic soda and allowing it to remain from 1 to 2 minutes. Following this treatment the fruit is thoroughly washed to remove the loose peelings and all traces of the soda. It is claimed that by this process there is a considerable saving of fruit, the fruit retains all of its original flavor and firmness, and ripe soft fruit and small irregular fruit can be peeled as readily as the better specimens. The process is considered to be simple, sanitary, and economical and can be used successfully in the home, in the small cannery, and in the large commercial cannery. The only precaution necessary is to use only porcelain-lined or wooden vessels.

Scientific research in the canning industry, W. D. BIGELOW (*Jour. Franklin Inst.*, 186 (1918), No. 1, pp. 1-14).—This is a general description of the problems occurring in the canning industry.

Home canning: One-period, cold-pack method, ROBERTA McNEILL (*S. Dak. Col. Agr. Ext. Circ.* 4 (1918), pp. 8).—A brief manual of directions.

Evaporation of fruits and vegetables in the home, A. F. BARSS (*Oreg. Agr. Col., Ext. Bul.* 296 (1918), pp. 3-12, fig. 1).—This bulletin describes systems of drying or evaporating and gives directions for the construction and operation of

home evaporators. Supplementary directions for the evaporation of various fruits and vegetables are included.

METEOROLOGY.

A new seasonal precipitation factor of interest to geographers and agriculturists, R. M. HARPER (*Science, n. ser.*, 48 (1918), No. 1235, pp. 208-211).—A preliminary account is given of comparisons of early and late rainfall in the United States and of the suggested climatic soil and plant growth correlations. In making this study "it was found that the most striking results were obtained by taking the difference between the rainfall for April to June, inclusive, and that for August to October, inclusive, the former being good for the crops and the latter bad for the soil."

The data indicate that "nearly all our tornadoes occur in the region of considerable early summer excess of precipitation, and our hurricanes in that of considerable late summer excess, while regions where the difference is not more than an inch or two either way rarely suffer much damage from wind. Both tornadoes and hurricanes usually occur during the period of greatest rainfall in their respective regions. The late summer rains commonly come in the form of showers in the daytime, while the early summer rain is more likely to fall gently and at night. . . .

"The most fertile soils are in the region where there is more rain in early summer than in late summer, and vice versa. . . . The regions of heavy late summer rain are characterized by poor sandy soils. . . .

"The distribution of vegetation types is of course correlated with the soil to a considerable extent," but "some correlations between seasonal rainfall and crops are easily made. Alfalfa, wheat, figs, and Upland cotton are not raised much where the late summer rainfall exceeds that of early summer by more than 3 in., while sugar-cane, pineapples, grapefruit, and Sea Island cotton thrive where late summer rains prevail. But of course the soil has a great deal to do with this too."

Further study of halos in relation to weather, H. H. MARTIN (*U. S. Mo. Weather Rev.*, 46 (1918), No. 3, pp. 119, 120).—This article gives the results of various observers in different parts of the United States as well as the author's observations at Columbus, Ohio, and discusses the possible relation between these results and latitude, longitude, and the average cyclonic tracks.

The general conclusion is "that the halo indicates the approach of precipitation only in so far as it heralds the approach of the cyclone. To only the extent that the passage of the cyclone affects the weather at the station is the halo reliable. With knowledge of the condition of the barometer, whether rising or falling, and knowing which direction of the wind most often precedes precipitation, the layman may know what degree of faith to place in the celestial harbingers. . . . The halo is a faithful detector of cyclonic presence; the pressure and wind indicate the cyclone's approach and passage, and a just consideration of these three elements will go far to establish the halo, not as a promise of rain or storm but as a warning that somewhere far to westward a cyclone is advancing. In this point alone the halo excels."

Monthly Weather Review (*U. S. Mo. Weather Rev.*, 46 (1918), Nos. 3, pp. 115-162, pls. 9, figs. 10; 4, pp. 163-206, pls. 10, figs. 8).—In addition to weather forecasts, river and flood observations, and seismological reports for March and April, 1918; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during March and

April, 1918; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 3.—A Promising Chemical Photometer for Plant Physiological Research, by C. S. Ridgway (see p. 524); Further Study of Halos in Relation to Weather, by H. H. Martin (see p. 511); Remarkable Halo Observed at Nashville, Tenn., March 16, 1918 (illus.), by R. M. Williamson; Solar Halo Phenomena Observed March 16, 1918, at Banners Elk, N. C. (illus.), by T. L. Lowe; Solar Disturbances and Terrestrial Weather (illus.), by E. Huntington (continued); and Breathing Well in California, by N. M. Cunningham.

No. 4.—Absorption and Radiation of the Solar Atmosphere, by S. Hirayama (reprinted abs.); Halo of April 14, 1918, at Columbus, Ohio (illus.), by H. H. Martin; Inferior Arc of 46°-Halo, April 25, 1918, by J. L. Vesper; Elliptical Halos of Vertical Major Axis, by J. B. Dale (reprinted); Real Velocities of Meteors, by C. P. Olivier (reprinted abs.); Visible Weather [Chinook Weather], by R. T. Pound (reprinted); Weather Bureau Observations in Connection with the Solar Total Eclipse of June 8, 1918, by H. H. Kimball and S. P. Ferguson; Solar Disturbances and Terrestrial Weather (illus.), by E. Huntington (continued); Changes in Oceanic and Atmospheric Temperatures and Their Relation to Changes in the Sun's Activity, by F. Nansen (reprinted abs.); Whirlwind of January 26, 1918, at Pasadena, Cal. (illus.), by F. A. Carpenter; Evaporation from a Circular Water Surface, by Nesta Thomas and A. Ferguson (reprinted abs.) (E. S. R., 38, p. 115); Redetermination of Heat of Vaporization of Water, by J. H. Mathews (reprinted abs.); Suggestions as to the Conditions Precedent to the Occurrence of Summer Thunderstorms, with Special Reference to That of June 14, 1914; by J. Fairgrieve (reprinted abs.); and Earthquake Weather.

Meteorological observations, P. VAN DER ELST (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1916*, pp. 359-361).—Ways in which the meteorological service of the Dutch East Indies may be made more serviceable to agriculture are briefly outlined, and the steps taken to carry some of the recommendations into effect are described. Ecological studies, especially those relating to rice, are to be intensified under the reorganization.

SOILS—FERTILIZERS.

Soil conditions and plant growth, E. J. RUSSELL (*London: Longmans, Green & Co., 1917*, 3. ed., rev., pp. VII+243, figs. 14).—This is a further revision of a work previously noted (E. S. R., 34, p. 321). Considerable alterations have been made in the text and a new chapter on the colloidal properties of soil has been added. The revision is thoroughly up-to-date and is based upon a discriminating selection of the more important contributions to the subject since the previous edition was issued. Some contributions omitted from the former editions are also included. Incidentally the author calls attention to the lack of a suitable name for the subject with which this treatise deals.

Surface geology of Michigan, F. LEVERETT (*Mich. Geol. and Biol. Survey Pub. 25, Geol. Ser. 21 (1917)*, pp. 43-215, pls. 15, figs. 4).—This is a revised reprint of papers which have been previously noted (E. S. R., 21, p. 718; 28, p. 422).

The effect of cattle on the erosion of canyon bottoms, J. T. DUCE (*Science, n. ser.*, 47 (1918), No. 1219, pp. 450-452).—From a study of the steep-walled arroyos of southern Colorado the author concludes that their development has been contemporaneous with the development of ranching, and he believes they are due to the wearing of trails and the destruction of vegetation by cattle.

Soil survey of Jasper County, Ga., D. D. LONG and M. E. CARR (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916*, pp. 43, fig. 1, map 1).—This survey, made in cooperation with the Georgia State College of Agriculture, deals

with the soils of an area of 241,280 acres situated in the central part of the State and lying within the Piedmont Plateau region. The topography is generally rolling, with some hilly and broken areas, together with inextensive "flatwoods" or "glades." Natural drainage is thoroughly established except in the flatwoods.

The soils of the county are mostly residual in origin, being derived from igneous, metamorphic-igneous, and sedimentary rocks of varying composition. Small areas of alluvial soils occur along the streams. Sixteen soil types of 11 series are mapped, in addition to meadow (Congaree material). Davidson clay, Cecil clay loam, Davidson clay loam, and Cecil sandy clay loam predominate, occupying 23.2, 18.3, 17.6, and 15.9 per cent of the total area, respectively.

Soil survey of Box Butte County, Nebr., F. A. HAYES and J. H. AGEE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 34, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 684,800 acres lying near the northwestern corner of the State. The topography of the region ranges from almost flat on the tablelands to rough and extremely dissected in the descents toward the stream beds. Erosion by both wind and water is said to have greatly influenced the topography. The elevation of the county ranges from 3,850 to 4,600 ft. above sea level. Natural drainage is generally well established.

The soils of the county are grouped in respect to origin as residual, alluvial, æolian, and miscellaneous. Twelve soil types of 7 series are mapped, exclusive of miscellaneous materials mapped as dune sand, meadow, and rough broken land. Rosebud very fine sandy loam, Rosebud silt loam, and Valentine loamy fine sand predominate, occupying 34.2, 20, and 12.3 per cent of the total area, respectively.

Soil survey of Yates County, N. Y., E. T. MAXON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 36, fig. 1, map 1*).—This survey, made in cooperation with Cornell University, deals with the soils of an area of 219,520 acres lying in the central part of western New York. The surface varies from undulating or gently rolling in the extreme eastern and northeastern parts of the county to hilly or semimountainous in the southern and southwestern parts. The elevation ranges from 440 ft. above sea level in the northwestern part of the area to 2,110 ft. in the southwestern part. The uplands have fair to good natural drainage, while the bottom lands are poorly drained.

The soils of the county are derived chiefly from glacial débris composed of sandstone, shale, and limestone, while areas of alluvial, residual, or cumulose soils are also present. Twenty-one soil types representing 10 series are mapped, in addition to muck and rough stony land. Ontario loam, Volusia silt loam, and Lordstown stony silt loam, occupying 20.9, 17.7, and 12.1 per cent of the total area, respectively, predominate.

On the origin of "terra rossa" (red soil) in Italy, M. GORTANI (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 1, pp. 23, 24; Chem. Abs., 12 (1918), No. 16, p. 1676*).—This article reviews various theories of the origin of the red soils of Italy, particularly that of Galdieri. The author's tentative conclusion is that "terra rossa" is the insoluble residue from the disintegration of limestones and dolomites, consisting essentially of hydrates of aluminum generally combined with hydrates of iron and other mineral substances. He, however, believes that more searching investigation of the subject is necessary before positive conclusions can be drawn.

Soil acidity.—I. Its relation to the growth of plants, E. TRUOG (*Soil Sci., 5 (1918), No. 3, pp. 169-195*).—This paper, a contribution from the Wisconsin Experiment Station, is the first of a series of articles on the subject of soil

acidity. It comprises a detailed consideration of its harmful effects on plant growth as shown by the work of numerous investigators, together with an exposition of the author's theory for the causes of these detrimental influences.

The causes, as suggested by the different investigators, have been classified as (1) indirect and general, due to the effect of soil acidity upon the general fertility of the soil, upon the prevalence of plant diseases, and upon the competitive powers of different species of plants; and (2) direct and specific, due to the effect of soil acidity upon the supply of available calcium needed by plants as direct plant-food material, upon the symbiotic nitrogen-fixing bacteria of the legumes, and upon the root tissues of plants. These points are discussed separately, but are deemed an inadequate explanation of the specific causes of the phenomenon.

The thesis is advanced that the injurious effect of soil acidity on certain plants is due primarily to its influences in preventing the plants from obtaining at a sufficiently rapid rate the calcium as the carbonate or bicarbonate which they need to neutralize and precipitate certain acids in the plants themselves, which are thought to be largely by-products following certain vital reactions in the growth of plants. This theory is based upon the assumption that each species of plant has a certain lime requirement, defined as "the actual lime needs of the plant itself, especially as to the ease and rate at which lime must be secured from the soil by the plant for normal growth," and that this lime requirement must be satisfied.

Three main factors are said to determine the lime requirement of a plant, namely, the lime content of the plant, the rate of growth, and the feeding power of the plant for lime. The first two factors operate in one direction, and the third operates in the opposite direction, the resultant of the three giving the lime requirement of the plant. A simple method of expressing these factors and obtaining the resultant is described.

A tabular statement compiled from various sources and showing the lime requirements of 62 species of plants, including a wide variety of field and garden crops and 4 kinds of trees, is presented, together with comparative figures representing the relative response of these plants to the liming of acid soils and their ability to grow on acid soils. "The comparison reveals a close correspondence and hence substantiates the theory which has been proposed that usually the main specific injury of soil acidity is that it prevents plants, especially those with high lime requirements and relatively weak feeding powers, from getting the lime from the soil at a sufficiently rapid rate to meet their needs. This is further substantiated by the parallel relation found between the amount of growth of alfalfa on acid soils and the amount of calcium which could be extracted with carbonated water from these soils. These considerations are specially important in formulating a practical system of using lime, especially as regards the amount to be used which, as is discussed in detail, is dependent on the lime requirement of the crop, the degree of acidity of the soil, and the fertility of the soil."

A list of references comprising 49 titles is appended.

The action of neutral salts on humus and other experiments on soil acidity, L. J. GILLESPIE and L. E. WISE (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 5, pp. 796-813, fig. 1).—In the investigations by the Bureau of Plant Industry of the U. S. Department of Agriculture here reported, "the action of humus on solutions of sodium, potassium, and barium chlorids of different strengths was studied by means of the hydrogen electrode.

"The measurements showed that on the addition of chlorids to humus solutions or suspensions the potential of the gas chain was very considerably

lowered, showing that there was a large increase of hydrogen-ion concentration. Similar effects of smaller magnitude were seen in the action of potassium chlorid on true solutions in the absence of humus or undissolved substance; these effects make it unsafe to draw conclusions as to the detailed mechanism of the process in the case of humus. At equivalent concentrations barium chlorid exerted the greatest effect on the potential of humus preparations. The direction of the diffusion potentials and the uncertainty of their magnitude would seem to make it unsafe to conclude from these experiments that barium reacts more extensively with humus than potassium.

"Some experiments with litmus paper served to call attention to the difficulties and limitations of the litmus-paper test as applied to soils and soil extracts. These experiments make it plain that there is no ground for a recent classification of soils which respond in the moist state to blue litmus paper into two types, 'truly acid' and otherwise, according to the behavior of the litmus paper toward the aqueous soil extract. Litmus paper can not be used, without suitable precautions, to arrange soils in the order of their intensities of acidity. No proof has yet been brought forth that soils can act on litmus paper solely by virtue of their adsorptive capacity. The behavior of litmus paper toward the moist soil and the soil extract can be explained in a simple way without reference to adsorption.

"It has been pointed out that it is dangerous to make broad general statements as to the cause of soil acidity. Against the positive evidence, obtained by means of the hydrogen electrode and suitable indicators, in favor of the common occurrence of truly acid soils, there has been produced no valid negative evidence based on adsorption or on the behavior of soils toward neutral salts. Truly acid soils are not rare, but very common and widely distributed in the United States."

The value of blue litmus paper from different sources as a test for soil acidity, P. E. KARRAKER (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 4, pp. 180-182).—This paper, a contribution from the Kentucky Experiment Station, gives a brief account of trials of samples of blue litmus paper from various sources in a comparison with a very sensitive Kalbaum paper by testing for acidity in a soil having a limestone requirement of 2,912 lbs., as determined by the lime-water method. The Kalbaum paper showed a distinct pink in 2 minutes, the maximum color being attained in about 5 minutes. The other samples varied from about 5 minutes to 2 hours, while some failed to show any color at all.

Tests made in thousandth-normal hydrochloric acid solution showed the same relative sensitiveness as that observed in the soil. Neutral litmus papers from different sources failed to give distinct color changes and are deemed unsuited for this work.

The Kalbaum paper placed in soils of limestone origin that produced vigorous effervescence with hydrochloric acid showed a slight pink after 30 minutes in a heavy subsoil, but remained blue in a lighter surface soil, indicating a tendency for sensitive paper to develop a pink color in soils of high colloidal content even in the absence of an acid condition.

"It is thought inadvisable to recommend the blue litmus paper test to farmers as a means of testing for soil acidity. In the hands of an operator who is familiar with the paper he is using and knows what color changes to expect under various conditions, the test is a good qualitative one for soil acidity, and in addition gives some information in a quantitative way, but for general use it can not be considered reliable and may give results which are entirely misleading."

Studies on the correlation between the production of carbon dioxide and the accumulation of ammonia by soil organisms, J. R. NELLER (*Soil Sci.*, 5 (1918), No. 3, pp. 225-241, figs. 6).—This paper, a contribution from the New Jersey Experiment Stations, reports the progress of investigations to ascertain the relationship between ammonia accumulation in the soil and biological activity as measured by carbon dioxide production. Studies have been made of the organic decomposition by pure cultures and mixtures of pure cultures of bacteria and fungi and of soil infusions employing 1 per cent of cottonseed meal or of alfalfa as a source of organic matter in Norfolk sandy loam soil. An apparatus is described and illustrated for the quantitative determination of carbon dioxide evolved biologically from the soil. Tabulated data are presented and fully discussed, showing the carbon dioxide production and ammonia accumulation with the various treatments and the relative oxidizing and ammonifying power of the different pure cultures and mixtures. The results obtained may be briefly summarized as follows:

Duplicate determinations indicated that carbon dioxide production was more uniform than ammonia accumulation for a 12-day period. A high carbon dioxide production by pure cultures of bacteria was accompanied generally by a high ammonia accumulation with 1 per cent of either cottonseed meal or alfalfa in Norfolk sandy loam. Pure cultures of fungi oxidized more of the carbon of alfalfa than the pure cultures of bacteria, but the latter caused the accumulation of much more ammonia. The more active species of fungi not only caused no accumulation of ammonia, but even used up some of the small amounts appearing in the checks. Soil infusions gave results similar to those from fungus cultures with respect to ammonia accumulation, but were more active in the production of carbon dioxide. A low accumulation of ammonia with alfalfa as a source of organic matter is held to indicate a high rather than a low activity. Since the behavior of soil infusions resembled that of fungi rather than that of bacteria, fungi are deemed to be the more active components of the natural soil flora. The mixtures of pure cultures of bacteria showed no antagonism, and in some cases a symbiotic relation seemed to exist. Mixtures of pure cultures of fungi or of fungi and bacteria have not been studied sufficiently to permit of any conclusions at this time.

A list of 14 titles comprising the literature cited is appended.

The effect of certain factors on the carbon dioxide content of soil air, J. A. BIZZELL and T. L. LYON (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 3, pp. 97-112, figs. 9; *abs. in Chem. Abs.*, 12 (1918), No. 9, p. 967).—Observations on the effects upon the carbon dioxide content of soil air of a growing crop (oats), quicklime, and limestone are recorded. The investigations were conducted with the Dunkirk clay loam and Volusia silt loam soils in the large lysimeter tanks at Cornell University (E. S. R., 21, p. 117), the samples of air being collected from the drainage tubes. Carbon dioxide determinations were made weekly from June 21 to September 27, 1916. The results are fully discussed and plotted in curves.

The authors conclude that "on Dunkirk clay loam cropping with oats produced striking fluctuations in the carbon dioxide content of the soil air. The greatest apparent production was at the blooming period. Subsequent to the blooming period there was a marked decrease in the amount of carbon dioxide, and this decrease was apparently due to the depressing effect of the crop on production by bacterial action. On Volusia silt loam the crop apparently had little effect on the carbon dioxide content.

"On Volusia silt loam addition of quicklime increased the amount of carbon dioxide in the soil air. This effect was noticed both on the cropped and un-

cropped tanks. On Dunkirk clay loam quicklime apparently produced no effect.

"Treatment of Volusia silt loam with burnt lime was accompanied by larger production of carbon dioxide than was the treatment with a chemically equivalent quantity of ground limestone."

The gases of swamp rice soils, W. H. HARRISON and P. A. SUBRAMANIA AIYER (*Abs. Bact.*, 1 (1917), No. 6, pp. 519, 520).—A brief review of the four series of papers on this subject previously noted from another source (E. S. R., 37, p. 424.)

Lysimeter experiments. Records for tanks 1 to 12 during the years 1910 to 1914, inclusive, T. L. LYON and J. A. BIZZELL (*New York Cornell Sta. Mem.* 12 (1918), pp. 115, pls. 4, figs. 9).—The authors present a detailed report on investigations "designed to ascertain the extent to which, and some of the conditions under which, calcium is removed in drainage water and in crops from one or two rather prevalent soil types, and at the same time to study certain of the changes that accompany the loss of calcium. With this in view, the removal of magnesium, potassium, sodium, nitrogen, sulphur, phosphorus, and a few less important elements has been determined, in order to discover the relations between these substances and to ascertain whether substitutions of one for another occur in the soil with release in the drainage water of the replaced constituent."

The 12 lysimeters used in the experiments consisted of concrete tanks slightly over 4 ft. square and of about the same depth. The bottoms were funnel-shaped, with drainpipes leading to a tunnel where the drainage water was collected. The tanks were lined with water-proofing asphaltum. Each tank was filled with $3\frac{1}{2}$ tons of Dunkirk clay loam soil, taken from the field in layers 1 ft. in depth and placed in the tank in the order in which the layers occurred in the field. Some of the tanks were cropped, while others were left bare. Certain tanks received an application of burnt lime at the beginning of the experiment and some received annual applications of sulphate of potash. All tanks received the natural rainfall but no other water. The drainage water that percolated through the soil was collected, measured, and analyzed. For purposes of comparison plats were laid out in the field from which the soil was obtained for the tanks and received the same treatments as the tank soil.

The average annual rainfall for the five years was 31.14 in., of which 24.4 in. percolated through the unplanted soil and 16.96 in. percolated through the cropped soil. About one-half of the rainfall passed into the air from the surface of the soil and through the plants growing on it. In general the largest flow of drainage water was during March and April. Applications of lime had no appreciable effect on the proportion of rainfall that percolated through the soil.

The average evapo-transpiration ratio for the cropped soils was 1:580, the crops being maize, oats, wheat, timothy, clover, and mixed grasses. The average minimum transpiration ratio for the same crops was 1:290, being least for maize and greatest for the grasses, while oats was intermediate. With crops of large yield, amounting in the case of maize to over 100 bu. of grain, there was never a deficiency of moisture in the soil, illustrating the great water-holding capacity of a well-drained soil.

The quantity of nitrogen in the drainage water from the unplanted soil was 17 times as much as in the water from the cropped soil. Lime had no effect on the amount of nitrogen contained in the drainage water nor on the quantity in the nonleguminous crops. More nitrogen was found in the drainage water of the unplanted tanks than in both the drainage water and the crops of the planted tanks. Some plants seemed to use a greater quantity of soil nitrogen than did others, without causing the nitrates in the drainage water to become

less. The data appear to support the idea that certain kinds of plants have a depressing influence on the production of nitrates in soil.

The quantity of calcium in the drainage water of the unplanted soil was greater than that in the crops and the drainage water combined on the planted tanks, making possible a conservation of 181 lbs. of calcium per acre by cropping the soil instead of leaving it bare. The larger removal of calcium in the drainage water from unplanted soil than from cropped soil was thought to be due largely to the much greater quantity of nitric acid leached from the unplanted soil. Carbonic acid also was regarded as a factor in the greater removal of calcium from the bare soil. Both the total quantity and the concentration of bicarbonates was greater in the drainage water from the bare soil. The large amount of carbonic acid excreted by the roots of plants was deemed to have no effect in increasing the solvent action of the soil water on calcium, probably because the soil water was already saturated with carbon dioxid. Lime applied at the rate of 3,000 lbs. per acre did not increase the quantity of calcium in the drainage water or in the ash of the crops produced, but the percentage of calcium was, in the main, somewhat higher in the crops raised on the limed soil. Annual applications of potassium sulphate at the rate of 200 lbs. per acre materially increased the quantity of calcium in the drainage water. To maintain the soil supply of calcium up to its present amount would require an annual application of 514 lbs. per acre for uncropped soil or 271 lbs. per acre for cropped soil.

Magnesium was found in much smaller quantity in the drainage water than was calcium, and its removal was also decreased by cropping. The addition of lime and of sulphate of potash resulted in a liberation of magnesium, as indicated by its greater removal in the drainage water. The calcium-magnesium ratio was much wider in the drainage water than in the soil, owing to the greater solubility of calcium over magnesium, while the application of lime, by rendering the magnesium more soluble, narrowed the calcium-magnesium ratio in the drainage water.

Potassium was removed in smaller quantity by the drainage water than by the crops, differing in this respect from calcium, magnesium, and sodium. The application of lime did not result in an increase in the quantity of potassium contained in the drainage water nor in the amount removed by the crops. Applications of sulphate of potash did not cause an increase in the removal of potassium in the drainage water.

Sodium was taken up in small amounts by crops, but was removed in larger quantity in the drainage water than was either magnesium or potassium. Application of lime decreased the removal of sodium both by crops and in the drainage water.

The removal of sulphur in the drainage water was from three to six times as great as in the crops, about as much being carried off by the drainage water from the unplanted soil as was removed by both drainage water and crops from the planted soil. The addition of lime was followed by an increase in the quantity of sulphur in the drainage water. Of the sulphur added to the soil in the form of sulphate of potash, more than one-half was removed in the drainage.

Only a trace of phosphorus was observed in the drainage water from any of these tanks. There appeared to be no relation between the lime applications and the quantities of phosphorus removed in the crops.

A brief account of the methods of analysis employed in the investigations and considerable tabulated data are appended, together with a bibliography of 39 titles.

Tests of an "all crops" soil inoculum, P. EMERSON (*Maryland Sta. Bul.* 214 (1918), pp. 127-149, figs. 5).—Laboratory and field tests of a so-called "all crops" soil inoculum are described. The laboratory tests embraced a comparison of the inoculum with an ordinary garden soil in bacterial, mold, protozoan, and algæ content; in cellulose decomposing power; and in ammonifying, nitrifying, and nitrogen-fixing powers. In addition, tests of the nitrogen-fixing powers of the inoculum were also made under varying conditions in the greenhouse and in the field. The results obtained are presented in tabular form and fully discussed, and may be summarized as follows:

Chemical activities of the inoculum in the laboratory tests were neither superior nor inferior to those of an ordinary garden soil, except that its cellulose decomposing power was found to be greater. The addition of the inoculum to a soil did not affect either the bacterial content or the bacterial activities of the soil after 60 days. When added to fallow soil the inoculum showed a reduction in the nitrogen content of the soil after 60 days. Soy beans and oats grown on the soil slightly stimulated the nitrogen-fixing powers of the inoculum, while corn and wheat seemed to retard it and red clover appeared to have no effect. Lime, as calcium carbonate, and lime and manure together added to an inoculated soil resulted in a decrease in the nitrogen content, while manure alone slightly stimulated the nitrogen-fixing powers. The action of the inoculum was found to be slightly beneficial to wheat and corn in the field, more so for red clover, and detrimental to soy beans.

On making and storing farmyard manure, E. J. RUSSELL and E. H. RICHARDS (*Jour. Roy. Agr. Soc. England*, 77 (1916), pp. 1-36, figs. 8).—The history of the handling and use of manure is briefly reviewed, the relation of manure to food is explained, and the following topics are discussed on the basis of experimental work at Rothamsted and elsewhere: Composition of manure as made on the farm; losses during storage including effect of compacting, shelter, moisture content, moving the heap, and summer storage; decomposition of manure under carefully controlled laboratory conditions; manure heaps in practice; hauling out the manure; and storage of dairy manure.

The authors' practical purpose was to find out whether the investigations that have been made suggest any better way of dealing with manure than has been used hitherto. Their general conclusion is that present methods of storing manure are essentially wasteful, and that while certain precautions may be taken in winter, spring, and early summer to reduce the loss, they are not wholly successful and are apt to break down in the summer. Exposure of manure to weather always leads to loss. The smallest loss occurs when the manure is made under cover and applied to the land directly it is hauled out. This, however, is not always practicable.

When it is necessary to keep the manure in a heap this should be compacted and sheltered. "Compacting and sheltering only delay the decomposition processes and do not entirely stop them. They are effective in winter, spring, and early summer, but they are apt to break down in late summer when the outside temperature is high. Summer storage of manure is very wasteful and may be a serious source of loss on farms where the acreage under roots or potatoes is insufficient to absorb all the manure produced. If, however, it were possible to store the manure entirely out of contact with air a rise of temperature would be actually helpful and not harmful. Under these conditions there is not only no loss, but a positive gain in value of the manure. We hope to be able to make the necessary large scale trials in the near future."

The authors are of the opinion that on dairy farms provision should be made to collect the urine in the cow houses, and they consider the Belgian tank

(E. S. R., 38, p. 86) well suited to this purpose. In this case the solid manure and litter should be kept in a sheltered and compacted heap with a tank to collect the drainings.

Nitrification of manure in the field, C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 150 (1917), pp. 13; *K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 5, pp. 402-412; *abs. in Chem. Abs.*, 12 (1918), No. 7, p. 736).—Investigations are reported which indicate that more or less ammonia nitrogen is produced in the course of five months in manure spread in the field, but that this does not account for all of the ammonia nitrogen fixed in the manure during this period. The nitrate nitrogen formed from the ammonia nitrogen was found to be practically constant and independent of the absolute amount of manure added to the soil. Nitric nitrogen developed fully as well in acid soils as in neutral soils. Previous observations of the author that the ammonia nitrogen changes into nitrate nitrogen less readily than organic nitrogen were confirmed, this being probably explained by the increase of hydrogen-ion concentration resulting from the transformation of ammonium sulphate.

Why not fertilize in the hill? C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 6, pp. 182, 183).—The advantage of broadcasting fertilizers and manure over hill fertilizing, with particular reference to the effect upon the succeeding crops as demonstrated by results obtained with crops grown in rotation at Wooster and at Strongsville, is briefly discussed.

Absorption and nitrification of ammonium compounds in the presence of zeolites in soil. Estimation of ammonia in soil and on zeolitic substances, F. MÜNTER (*Landw. Vers. Stat.*, 90 (1917), pp. 147-189; *abs. in Jour. Chem. Soc. [London]*, 112 (1917), No. 662, I, pp. 722, 723).—Experiments are reported which show that sandy soils are capable of absorbing ammonia from ammonium sulphate to an appreciable extent and that over 10 per cent of the ammonia so absorbed can not be recovered by distillation with magnesia.

The addition of zeolites increased the amount of ammonia absorbed by a further 20 to 25 per cent of the total added. The ammonia held by the sandy soil was found to be more easily nitrified than that absorbed by zeolites. The ammonia retained by zeolites, when boiled with magnesia, was completely recovered by a further addition of potassium chlorid before distillation. That retained by soil was found to be more resistant to this treatment. Pure sand did not absorb ammonia and the addition of silicic acid and aluminum hydroxid was without effect.

"The hydroxids and carbonates of calcium, barium, strontium, and sodium, with or without the addition of neutral salts, either fail to expel all the absorbed ammonia or else lead to decomposition of the soil organic matter. The general conclusion is drawn that adsorption and absorption occur simultaneously in the soil without any definite relation existing between the two."

Trials on grassland with open-hearth basic slag and rock phosphates, G. S. ROBERTSON (*Jour. Bd. Agr. [London]*, 24 (1918), No. 10, pp. 1077-1086).—The author presents a preliminary report on tests of the relative value of low and high citric-soluble phosphates on meadow hay grown on three types of soil in Essex. The experiments were planned primarily to determine the value of open-hearth basic slag, or fluorspar slag, recommended for use by Gilchrist and Louis (E. S. R., 37, p. 723), and they include a comparison of high-grade basic slag with a solubility of the phosphate in 2 per cent citric acid, of 92 per cent Gafsa rock phosphate with a solubility of 38.3 per cent, and two low-grade slags with solubilities of 93.4 and 82.2 per cent, respectively. The fluorspar slag employed had a solubility of 45 per cent. The results obtained in 1916 and in

1917 are tabulated, showing the yields of hay on each soil type and for each treatment, and are briefly discussed.

The average increases for all the tests over the untreated checks amounted to 36.8 per cent for the high-grade basic slag, 28.2 per cent for Gafsa rock phosphate, 42.6 per cent for fluorspar slag, and 31.3 and 37.4 per cent, respectively, for the two low-grade high-soluble slags. The use of fluorspar slag is recommended for improving poor pasture and meadow land, and the normal high-soluble slags are recommended for cereal crops.

Reverted phosphate, C. C. JAMES (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 1, pp. 33-35, figs. 3).—A study in continuation of previous work (E. S. R., 38, p. 122) of the rate and extent of reversion of acid phosphate, when mixed with varying amounts and combinations of lime and calcium carbonate in laboratory experiments and factory tests, showed that complete reversion was obtained in a comparatively short time, but more quickly with lime than with calcium carbonate.

The author states that he has found "in numerous cases that the reverted phosphate is just as valuable or even more valuable than the water-soluble when applied to cane upon upland soils. These soils are, as a rule, highly ferruginous clays. On soils which have not been cropped for several years the reverted phosphate gives excellent results."

The phosphate production and resources of the world, P. G. MORGAN (*Jour. Agr. [New Zeal.]*, 16 (1918), No. 2, pp. 76-82).—This is a summarized discussion of available information obtained from various sources relative to the world's production and supply of phosphates.

Awards for the location of workable phosphatic deposits in Germany (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 9 (1918), No. 1, p. 42).—In order to increase the output of phosphates, of which there has been a shortage since the beginning of the war, "awards to the amount of 100,000 marks (\$23,800) have been offered for the location of new phosphate deposits and for their study, either within the German Empire or in the occupied territories in the East."

The collection of kelp in the United States for potash production (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 9 (1918), No. 1, p. 43).—Special attention is given in this article to the methods and machinery used in collecting the kelp.

Influence of gypsum upon the solubility of potash in soils, P. R. McMILLER (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 1, pp. 61-66).—Experiments at the Minnesota Experiment Station are reported which showed that when various soils mixed with 1 per cent of gypsum were kept under moisture conditions similar to those prevailing in the field (approximate moisture equivalent) for three months, there were marked increases in the content of water soluble potash. It is suggested that "the results in previously reported experiments by various investigators in which the action of gypsum has not been found to cause such an increase may be due to the conditions of contact between the soil and gypsum that they have employed being unlike those that obtain in the field."

Analyses of county limestone deposits, J. W. AMES (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 7, pp. 222, 223).—This reports the results of analyses of 254 samples of limestone from different sections of Ohio, showing the percentage of calcium carbonate equivalent to the neutralizing power of the calcium and magnesium content of the sample. The results "indicate that there are numerous undeveloped supplies which could be utilized locally to good advantage pro-

viding the quantity is sufficient to warrant installing a pulverizing outfit in the community."

An agronomic study of several fertilizing or antiercryptogamic compounds used in agriculture, B. DE WILKOSZEWSKI (*Arch. Sci. Phys. et Nat. [Geneva]*, 4. ser., 44 (1917), pp. 165-189; *abs. in Jour. Chem. Soc. [London]*, 112 (1917), No. 682, I. p. 723).—Examinations of percolates through columns of natural and artificial soils of different types treated with solutions of various salts showed that "iron in solution as ferric sulphate is more rapidly absorbed by the soil than in the ferrous state, any iron retained from ferrous sulphate being found in the ferric state in the soil. The salts are converted into their hydroxids, the ferrous hydroxid being subsequently oxidized and held in the soil in the ferric state. This hydrolysis is markedly favored by the presence of the soil particles. Similar results were obtained with manganese sulphate and copper sulphate, the salt in all cases undergoing hydrolysis and, where possible, oxidation, the base being retained in the soil and the acid ion passing on into the drainage water.

"In the case of calcium cyanamid this material is converted into carbamid, ammonium carbonate, and subsequently calcium nitrite and nitrate, the reaction being much more rapid where a solution is used than where the solid is itself mixed into the soil. The author considers that microorganisms are not essential for these changes, as they occurred in a sterilized soil. The oxidation to nitrite and nitrate goes on most rapidly in soils of a porous nature, such as the infusorial earths."

Sulphuric acid and fertilizer industries (*Chem. Trade Jour.*, 62 (1918), No. 1607, pp. 203-207; *rev. in Jour. Bd. Agr. [London]*, 25 (1918), No. 2, pp. 193-198).—This is a report of a committee appointed by the Minister of Munitions of Great Britain "to consider and report on the position of the sulphuric acid and fertilizer trades as affected by the new acid plants which have been erected during the war by the Minister of Munitions for the Government."

The committee estimates that there has been a 60 per cent increase in production of sulphuric acid since the beginning of the war, one-half of this increase being derived from works owned or controlled by the Government and operated mainly for supplying munitions works. Of the prewar production about 30 per cent was consumed in the manufacture of superphosphates and an equal amount in the manufacture of sulphate of ammonia. The prewar production capacity was considerably larger than the actual output.

At the outbreak of the war the output of ammonia amounted to 400,000 tons per annum expressed as sulphate. "About 15 per cent of this production was not put on the market in the form of sulphate, but was converted into other ammonia products. The home consumption of sulphate of ammonia for agricultural purposes was only 60,000 tons per annum, and the remainder was mainly exported." During the war "the production of sulphate of ammonia has, however, suffered a temporary decline, owing to the diversion of large quantities of ammonia to the production of nitrate of ammonia. In view of the requirements of sulphuric acid for explosives manufacture, plants have been erected on a considerable scale for the conversion of crude ammonia into concentrated ammoniacal liquor. A substantial proportion of the requirements of ammonia for munitions purposes have thus been purchased in a form which requires no sulphuric acid for its manufacture. The total production of sulphate has thus been temporarily reduced from 350,000 tons to a little over 250,000 tons. At the same time, there has been a large increase in the home consumption for agricultural purposes, owing to the substitution of this fertilizer for nitrate of soda, the entire supply of which has been required for explosives manufacture. The export trade has nearly disappeared."

"For some years before the war the manufacture of superphosphate . . . was in a very unsettled condition owing to the rapidly increasing importation of foreign manufacture and the gradual decline in the export trade. The export of superphosphates had reached a maximum of 160,000 tons in 1911, but had afterwards declined to 63,000 tons in 1913. . . . As in the case of sulphuric acid, the available plant was capable, if continuously worked, of producing considerably more than the actual requirements of superphosphate. . . . The production of superphosphate has been very materially reduced during the war owing to the lack of sulphuric acid. The production of superphosphate in 1916 fell to about 500,000 tons, as compared with about 800,000 tons in 1913. During the last few months, however, the paramount necessity of increasing the home-grown food supply has been realized, and steps have been taken to secure a large and immediate production of superphosphate."

The committee is of the opinion that "by far the most important prospect of utilizing the increased quantities of acid is in the manufacture of artificial fertilizers," and that "the large surplus of sulphuric acid plants which will become available at the end of the war provides an opportunity of an altogether exceptional nature for the development of a vigorous agricultural policy in relation to the efficient cultivation of the soil." It therefore recommends that the Government take every possible step through the exercise of its compulsory powers and by the use of educational methods of various kinds to extend the use of fertilizers.

Value of Philippine composts, F. B. SARAO (*Philippine Agr. and Forester*, 6 (1918), No. 5-6, pp. 128-134).—This reports the results of observations on the rate of decomposition and shrinkage, the percentage of moisture and total nitrogen, and the increase in total nitrogen in different materials composted in walled and unwalled and shaded and open piles. The materials studied included corn, cane, and sorghum trash; mixed herbaceous plants, including tomato and pea vines and amaranthus and other weeds; rice straw; cogon (*Imperata* sp.); bamboo leaves; and banana stems and leaves.

The cane trash compost showed the highest percentage of nitrogen, 0.9 per cent, that from corn trash and mixed herbaceous plants being next in order with 0.84 per cent each. Banana stems and leaves showed the highest shrinkage, and together with rice straw, composted most rapidly. Cogon showed the lowest shrinkage. No relation between the rate of decomposition and the percentage of nitrogen content in the compost was observed.

Water hyacinth (*Eichornia crassipes*): Its value as a fertilizer, R. S. FINLOW and K. McLEAN (*Agr. Research Inst. Pusa Bul. 71* (1917), pp. 16, pl. 1).—Analyses of the water hyacinth, said to occur as a noxious weed throughout the Dacca District of Bengal, are noted, and show the rotted or dried plant and ash to be quite rich in potash. The rotted material, containing about 65 per cent moisture, showed approximately 0.57 per cent nitrogen, 0.28 per cent phosphorus, and 2.57 per cent potash, while the dried plant contained from 1.5 to 2 per cent nitrogen and about 8 per cent potash. The ash showed from 25 to 35 per cent potash, mostly as chlorid, and in addition relatively large amounts of sodium, lime, and phosphoric acid.

Marked results were obtained from the use of both the rotted material and ash as a potash fertilizer for jute in rather extensive field tests on laterite soils of the old alluvium in Bengal.

The water hyacinth as a source of potash, F. W. F. DAY (*Agr. Bul. Fed. Malay States*, 6 (1918), No. 7-8, pp. 309-314).—In connection with work suggested by the article noted above, analyses were made of water hyacinths collected from different parts of the Federated Malay States, and similar results were obtained.

Whale fertilizer (*Agr. Gaz. Canada*, 5 (1918), No. 4, p. 370).—It is reported that the Department of Agriculture of Canada "has purchased for distribution in the Province [of British Columbia] 50 tons of whale fertilizer. It is manufactured from whale meat and blood, the oil having been extracted. Analysis shows it to contain 12.4 per cent of nitrogen. It is being sold to farmers and farmers' organizations at approximately \$72 per ton, which includes transportation."

Sources of fertilizing materials for Illinois farms, C. G. HOPKINS and F. C. BAUER (*Illinois Sta. Circ.* 223 (1918), pp. 8, fig. 1).—Information is presented relative to sources of supply readily available to Illinois farmers of agricultural limestone, limestone crushing machinery, limestone and phosphate spreaders, raw rock phosphate, bone meal, and potassium salts.

AGRICULTURAL BOTANY.

A promising chemical photometer for plant physiological research, C. S. RIDGWAY (*U. S. Mo. Weather Rec.*, 46 (1918), No. 3, pp. 117-119).—Attention is called to a chemical photometer which, so far as tested, seems adapted to use in investigations of the light relations of plants. The principle on which the photometer is based is the reaction of light to a mixture of oxalic acid and uranium salts. Comparisons were made with a pyrheliometer, the length of exposure of the solutions ranging from 8 to 24 hours, and very close agreements were shown. Other experiments conducted for the purpose of measuring the intensity of sunlight on clear days produced curves very similar to records obtained with the pyrheliometer.

The author claims that some of the probable advantages of the method are the ease and low cost with which it may be operated, the avoidance of complicated, costly, and frequently unreliable mechanisms, and the reduction of error due to the personal factor in observation, so prominent in the photographic paper method.

A comparison of salt requirements for young and for mature buckwheat plants in water cultures and sand cultures, J. W. SHIVE and W. H. MARTIN (*Amer. Jour. Bot.*, 5 (1918), No. 4, pp. 186-191).—In a preliminary presentation of the main results of an attempt to determine the best proportions of the 3-salt nutrient solution previously employed by Shive (*E. S. R.*, 34, p. 333) and here used according to methods described by him (*E. S. R.*, 36, p. 328), the authors state that the salt proportions giving the best physiological balance for buckwheat during the early and the late period of growth and maturation as here considered differ markedly and in the same manner with water cultures and with sand cultures. In three of the four series a definite correlation appeared between the growths of tops and that of roots. The 3-salt mixture had a total osmotic concentration of 1.75 atmospheres and with proper salt proportions produced markedly higher yields than did either Knop's or Tottigham's solution with the same concentration for the two growth periods here used.

The origin of inulin in plants, H. COLIN (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 5, pp. 224-227).—The tabulated results of studies on Jerusalem artichoke and chicory show that those portions of the plants which contained starch contained no inulin. In other portions the ratio of inulin to the total sugars present increased from the root tips to the crown and was found to be increasingly, though slightly, greater in the smaller tubercles, stolons, and larger tubercles.

Respiration and catalase activity in sweet corn, C. O. APPLEMAN (*Amer. Jour. Bot.*, 5 (1918), No. 4, pp. 267-269, fig. 1).—Having shown (*E. S. R.*, 36, p. 329) a relation between the respiratory activity of potato tubers and catalase activity

in the expressed juice, the author here records experimentation showing a relation between respiration and catalase in sweet corn in the milk stage after it is separated from the stalk. The decline in catalase activity after storage for five days is almost directly proportional to that in the respiratory activity of corn after storage for a like period. It is stated that the data from both plant and animal tissues available at present seem to justify the general induction that catalase action is invariably correlated with the oxidative processes involved in respiration.

The resistance of plants to cold, I. E. PANTANELLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 27 (1918), I, No. 3, pp. 126-130).—Tests were carried out with wheat, beet, and sunflower kept from January to April in a situation where they could be cooled below the freezing point and with tomato and maize kept from April to July in a situation where they could be exposed to a temperature of 33° C. (100.4° F.) by day, dropping at night to nearly 0°. Lime was supplied in constant concentration to all cultures. To this were added, singly or in combination (amounting in some cases to a complete fertilizer), various salts of sodium, potassium, ammonium, and magnesium. The effects of the various substances are detailed.

In case of wheat no relation was discovered between resistance to cold and molecular concentration, as measured by cryoscopic methods. Before refrigeration sugars were not more abundant in the more resistant plants, but during exposure to low temperatures the sugars decreased more noticeably in those plants which showed little resistance to cold.

Beets, especially the young plants, suffered more from low temperatures than did wheat. As in wheat, the nitrates and, in general, materials rich in nitrogen lowered resistance to cold. In the beet, also, no proportionality was noted between resistance and concentration. During refrigeration sugar disappeared from all these cultures. Starch practically disappeared from all the plants which suffered from cold, but a certain quantity remained in those which resisted cold.

The plant succession in the thorn veld, J. W. BEWS (*So. African Jour. Sci.*, 14 (1917), No. 4, pp. 153-172, pls. 4, figs. 2).—The author reports the results of recent study on the thorn veld in the vicinity of Pietermaritzburg.

This type begins with the establishment in ravines and near stream banks of trees, shrubs, and other forms, owing chiefly to the activities of birds and other animals named. The Acacias, especially *A. horrida* and *A. arabica kraussiana*, are the principal pioneer species, being able to dispense largely with protection. Many other species follow, growing up from the soft seed beds prepared by earthworms, termites, and ants, and utilizing the shade furnished by the acacias. The thorn trees usually remain dominant, though they are sometimes killed out by subsequent species. A long list of species is given as belonging to the thorn veld, with symbols denoting the relative frequency of their occurrence. Three formations, or important subformations, are distinguished as coastal, rocky place, and stream-bank types.

The direct influence of the sap elaborated by wild plants upon domesticated plants, and the influence of acid solutions directly absorbed, C. CAMPBELL (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 27 (1918), I, No. 1, pp. 57-61).—The author has undertaken to study the effect of the sap of wild grafts upon domesticated stocks and the effect of the direct absorption of various acid solutions by aerial portions of plants. Details are given of work as carried on during 1915 to 1917, inclusive. The effects obtained and discussed, which are considered to justify the continuation of this work, are resistance to disease and increase of leaf development and coloration.

The nutrition of green plants by means of organic substances, I, C. RAVENNA (*Gaz. Chim. Ital.*, 47 (1917), II, No. 3-4, pp. 131-139, figs. 3).—Maize grown under illumination but without oxygen in glucose solution showed the presence of amid in the leaves. The region of maximum amid formation and that of maximum chlorophyll activity in the solar spectrum were coincident. Amid was not found in plants cultivated in an atmosphere lacking carbon dioxide and oxygen.

The influence of some organic substances on plants, II, G. CIAMICIAN and C. RAVENNA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 27 (1918), I, No. 1, pp. 38-42).—This is a continuation of work previously noted (E. S. R., 37, p. 632). The effects are detailed, with hypotheses and discussion, of a number of organic compounds on the development of different plants.

The behavior of some organic substances in plants, VIII, G. CIAMICIAN and C. RAVENNA (*Gaz. Chim. Ital.*, 47 (1917), II, No. 2, pp. 99-107).—Certain features and findings of work previously noted (E. S. R., 37, p. 632) have led to the initiation of a series of studies regarding which this is considered as preliminary. The study has been extended from adult plants to germinating seeds of maize, wheat, bean, lupine, and vetch, and the substances dealt with include saligenin, hydroquinone, pyrocatechin, benzyl alcohol, gallic acid, and tannin. The results are detailed. It is thought probable that substances regarded as accessory may perform real functions, even though these may remain for the present unknown.

The behavior of some organic substances in plants, IX, G. CIAMICIAN and C. RAVENNA (*Gaz. Chim. Ital.*, 47 (1917), II, No. 3-4, pp. 109-130, figs. 2).—Dividing the organic substances occurring in plants into those which are known to be indispensable and those whose functions or effects are partly or wholly unknown, the authors deal in some detail in the first part of this communication with the influence on maize and beans of some organic substances as regards the germination and development of the plant. In the second part they take up the possible alterations which some compounds found to be present may undergo in the plant, experimental results and observations being detailed in this connection.

The influence of mineral materials on the germination of peas, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 2, pp. 45-51).—Following up experimentation with peas as previously noted (E. S. R., 38, p. 329), the author found calcium to be apparently the only substance the presence of which was sufficient to assure normal germination. This action was noted even in case of extremely weak solutions. Certain metals did not seem to favor the growth of the roots. The unfavorable effects of other substances are discussed.

The influence of salts of various metals on germination in the presence of calcium, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 3, pp. 89-92).—A continuation of the work reported above is said to have shown it to be true in general that various metals function during the course of germination as antagonistic to calcium.

Abnormalities of the ear in corn produced by treatment of the seed with copper, A. JUNGELSON (*Rev. Gén. Bot.*, 29 (1917), Nos. 344, pp. 244-248; 345, pp. 261-285, pls. 3, fig. 1).—Tests were made on the development of corn from seed kept before sprouting from 1 to 24 hours in 1 to 2 per cent copper sulphate after having been husked, deprived of endosperm, or pierced to the embryo, which was not mechanically injured. The author states that germinability was impaired, and the plantlets showed abnormal coloration as well as retardation of growth and flowering. The plant, after having been poisoned with copper showed a tendency to vary which was both quantitatively and qualitatively

expressed, but was not uniform in its expression. The new characters did not appear to be stable or hereditary, but the tendency to vary appeared to be transmitted.

The effect of tobacco smoke and of methyl iodid vapor on the growth of certain microorganisms, C. A. LUDWIG (*Amer. Jour. Bot.*, 5 (1918), No. 4, pp. 171-177).—The author records the effects of tobacco smoke and of methyl iodid vapor on a number of bacteria and fungi. He obtained with methyl iodid vapor, in general, an initial great retardation of development followed by very vigorous growth in cases where the strength was not sufficient to sterilize the culture. Tobacco smoke proved more or less toxic to the organisms, both bacteria and fungi, which were used, though not so much so as to some phanerogams which were tested.

Cell measurement as an aid in the analysis of quantitative variation, W. BROTHERTON, JR., and H. H. BARTLETT (*Amer. Jour. Bot.*, 5 (1918), No. 4, pp. 192-206, figs. 2).—In connection with genetic studies on *Phaseolus*, the authors have carried out studies of fluctuating variation due to the effect of light, said to be one of the most disturbing factors concerned in size inheritance.

It is stated that *P. multiflorus* grown in darkness may develop internode length as great as 3.6 times the normal length attained in light. This increase in length is said to be due to an increase in the number of divisions in the primary meristem (34 per cent) and in the length of the cell or group of cells derived from each primary division (66 per cent). Secondary cells formed by division of a primary cell during its extension are distinguished by the position of the cross walls. There appears to be a specific mean length, independent of light or darkness, for the division of the primary epidermal cells. It is necessary in appraising the relative importance of the cell number and size factors to discriminate carefully between primary and secondary cells.

Mutations of *Oenothera suaveolens*, H. DE VRIES (*Genetics*, 3 (1918), No. 1, pp. 1-26, figs. 4).—The author has studied the mutability of *O. suaveolens* in order to broaden the experimental field and meet the criticism of writers claiming that the phenomena reported as observed in experiments previously noted are essentially different from the origination of species and varieties in nature.

It is said that *O. suaveolens* has produced, under controlled conditions, since 1912 half a dozen different mutants, some of which are the same as those observed in allied species. Three such forms are named *lata*, *sulfurea*, and *lutescens*, and recur, respectively, in *O. lamarckiana*, *O. biennis*, and *O. grandiflora*. Among the special mutations, one, *O. suaveolens apetalu*, is of taxonomic nature, having flowers without petals. Two narrow-leaved types occurred, *O. fastigiata* having erect branches, and *O. jaculatrix* having almost linear leaves. The results are detailed of studies on these various forms and on crosses.

First results from planting wild fig, B. LONGO (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5, ser., 27 (1918), I, No. 1, pp. 55-57).—The author reports that planting the wild form of the fig (*Ficus carica*) gave as a result about as many plants of the cultivated as of the wild variety.

Studies on polyembryony, B. LONGO (*Ann. Bot. [Rome]*, 14 (1917), No. 3, pp. 151-162, fig. 1).—The author notes with discussion cases of polyembryony in *Xanthoxylum bungei* and *X. alatum*, also related phenomena in these and other plants.

Studies on the floral parts and genesis of the medlar, IRMA PIERPAOLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5, ser., 27 (1918), I, No. 3, pp. 121-125).—This is a study of several varieties of medlar (*Mespilus germanica*)

as regards the differences in the floral parts, with a statement and brief discussion of observed differences.

Plasmolysis of epidermal cells in the leaf of *Iris germanica*, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 5, pp. 222-224).—More recent studies (E. S. R., 35, p. 333) are noted as carried out on epidermal cells of *I. germanica*. This plant is said to lend itself readily to a study of plasmolytic phenomena, showing with remarkable clearness their structural details, in particular the presence and constitution of the chondriome, which is seen to be made up partly of granular mitochondria and partly of much-elongated chondriosomes.

The plasmolysis produced by solutions of sodium chlorid of various concentrations and by saccharose is said to give rise to a series of very characteristic phenomena, which are described.

Hypertonic solutions do not appear to act on the chondriome while the cell is alive. When the cell dies and the cytoplasm breaks up, freeing the mitochondria in the liquid of the cell cavity, the mitochondria swell up and assume the appearance of large vesicles.

Selected cycles in *Gymnoconia peckiana*, G. F. ATKINSON (*Amer. Jour. Bot.*, 5 (1918), No. 2, pp. 79-83).—The author briefly presents data claimed to show that *G. peckiana* is an example of a species in which the life cycle is not permanently fixed. In its more southern distribution it is generally, if not always, a one-generation cycle species and in its more northern distribution oftener, perhaps usually, a two-generation cycle species. Its habit in the intermediate region is probably determined by local and seasonal temperatures at the time of the germination of the aëdiospores. The bearing of the observed facts on the nomenclature of the fungus is briefly discussed.

FIELD CROPS.

[Report of field crops work in Louisiana, 1917], C. E. HESTER and F. C. QUEBEAU (*Louisiana Stat. Rpt. 1917*, pp. 18-20, 22-24).—This reports the continuation of work previously noted (E. S. R., 37, p. 529).

In fertilizer tests made at Calhoun, acid phosphate was found to produce a slightly higher yield of both cotton and corn than rock phosphate in a three-year rotation of cotton, corn, and a legume, and crimson clover followed by velvet beans.

Sentell White Dent, Hastings Prolific, and Gandy Prolific, with respective yields of 29.2, 28.7, and 28.3 bu. per acre, were first in corn variety tests. In percentage of grain, the leading varieties were Rogers with 88.2, Calhoun Red Cob (Crumpton) with 87.7, and Calhoun Red Cob (supple) with 87.3 per cent. The maximum yield of corn in fertilizer tests, 25 bu. per acre, was obtained from an application of 100 lbs. each of acid phosphate and nitrate of soda, while the lowest yield, 10 bu. per acre, followed a 300-lb. application of acid phosphate alone.

The highest yielding cotton varieties were Brown No. 1 with 1,331 lbs. of seed cotton per acre, Cleveland Big Boll with 1,326 lbs., and O'Bannon No Chop with 1,319 lbs. The lint percentages were 27.75, 25.5, and 30.75, respectively. In fertilizer experiments with cotton, an application of 100 lbs. of cottonseed meal per acre gave a 3-year average increase of about 200 lbs. of seed cotton. Applications of 200, 300, and 400 lbs. produced only small increases over the 100-lb. application. Acid phosphate at the rate of 100, 200, 300, and 400 lbs. per acre resulted in average increases of from 136 to 212 lbs. of seed cotton per acre for a three-year period.

Experiments to determine the best method of growing velvet beans with corn are described, in which the beans were grown between the hills in the corn rows and in rows alternating with corn. The corn yields for the two methods of planting were 18.8 and 11.6 bu. per acre, respectively, and the velvet bean yields 360 and 1,200 lbs. per acre.

Sweet potato variety tests are noted in which the different sorts were grown from slips or draws and from cuttings or vines. The yields from the slips ranged from 137.8 bu. per acre for Running Dooley to 190.8 bu. for Triumph, and from the cuttings they ranged from 23.4 bu. for Key West to 84 bu. for Jersey Yellow.

The results of fertilizer experiments with rice conducted at Crowley in cooperation with the U. S. Department of Agriculture have been summarized as follows: Two-hundred-lb. applications of 16 per cent acid phosphate appeared to give the best results with late varieties such as the Japans and Wright. It was not found profitable to grow rice more than five or six years in succession through the use of phosphate fertilizer. Acid phosphate is deemed best for all crops on reclaimed marsh land. Nitrogen was used to advantage on early varieties such as Honduras, while small applications were regarded as suitable for other varieties on land in a badly run-down condition. Commercial potash was deemed unnecessary. Most rice lands are said to need organic matter. Home-mixed fertilizers were found to be the most profitable.

Long rotations are said to be more profitable than short rotations in rice growing, due to the expense and labor involved in changing from rice to highland crops. Measures which have been found effective for the reduction of red rice include early mowing of rice stubble; the use of winter cover crops; and, for land badly infested, clean cultivated crops. "Straight head" in rice is thought to occur largely on land planted to a highland crop the previous year and which contains a large amount of organic matter. Observations are held to indicate that straight head does not occur on fields which have been drained and allowed to become dry some time during the growing season, and it does not appear to affect rice watered late in the season. The exact nature of the trouble has not yet been determined.

[The Woburn field experiments, 1916], J. A. VOELCKER (*Woburn Expt. Sta. Rpt. 1916*, pp. 1-19; *Jour. Roy. Agr. Soc. England*, 77 (1916), pp. 235-251).—In continuation of work previously noted (E. S. R., 37, p. 229), this reports results of field crops work for the season of 1916, a season marked by exceptional and generally unfavorable weather conditions, especially for the cereal crops.

The highest wheat yield in the continuous wheat tests was obtained from the plat receiving farmyard manure and amounted to 15.7 bu. of grain and 2,013 lbs. of straw per acre. Rape dust showed the next highest yield, 14.8 bu. of grain and 1,645 lbs. of straw. The average yield for the unfertilized check plats amounted to 6.4 bu. of grain and 714 lbs. of straw per acre. Ammonium sulphate used alone failed to give increased yields over the unfertilized plats, but when used in conjunction with lime or lime and minerals (acid phosphate and sulphate of potash) combined, increases resulted amounting to from 1.1 to 7.5 bu. per acre over the check plats. It has been concluded that ammonium sulphate and 1 ton of lime per acre will give good results, the beneficial effects of the lime being in evidence for at least 10 years, but that 10 cwt. of lime per acre is insufficient and 4 tons per acre excessive. The use of nitrate of soda with minerals resulted in 14.5 bu. of grain per acre, as compared with a yield of 14 bu. from ammonium sulphate used with mineral manures and lime. Applications of 1 and 2 cwt. of sodium nitrate used alone showed increased

yields over the untreated checks of 2 and 4.6 bu. per acre, respectively. With potassium sulphate and nitrate of soda there was a yield of 10.1 bu. as compared with a yield of 9.7 bu. per acre with acid phosphate and nitrate of soda.

The average yield of barley for the unfertilized plats in continuous barley tests amounted to 12.1 bu. of grain and 1,008 pounds of straw per acre. The highest yield was secured from farmyard manure and amounted to 32.9 bu. of grain and 2,836 lbs. of straw, while the plat receiving mineral fertilizer and nitrate of soda was second with 31.9 bu. of grain and 2,878 lbs. of straw per acre. Mineral fertilizers alone showed 17.3 bu. of grain per acre. The use of ammonium sulphate alone, as usual, gave no crop, but with mineral manures and 2 tons of lime of recent application there was a yield of 24.2 bu. per acre and increases over the untreated checks amounting to from 5 to 11.2 bu. with 4 tons of lime applied in earlier years. With double the amount of ammonium sulphate used with minerals and 4 tons of lime the yield was 24.7 bu. per acre. Applications of 1 and 2 cwt. of nitrate of soda gave yields amounting to 18.6 and 24 bu. per acre, respectively, while the addition of mineral manures resulted in yields of 26.4 and 31.9 bu. per acre, respectively. It has been concluded that an increase of from 5 to 6 bu. of grain and of from 5 to 7 cwt. of straw per acre may be expected from an application of 1 cwt. of nitrate of soda. With sulphate of potash and nitrate of soda the yield was 29.8 bu. per acre, as compared with 27.9 bu. from acid phosphate and nitrate of soda. All the barley was considered to be of rather inferior quality.

In rotation experiments to compare the unexhausted manurial value of corn (chaff and oats) and cake (linseed and cottonseed cake mixed), these were fed to sheep in addition to equal quantities of roots per acre for each of the two experimental plats and the residual value measured by the yield of swedes in 1916. The corn-fed plat gave a yield amounting to 25,116 lbs., as compared with 30,560 lbs. from the cake-fed plat.

In 1916, wheat followed green crops pastured by sheep in 1915 and gave yields amounting to 8.1 bu. after tares, 10.2 after rape, and 11.3 after mustard. Winter and spring wheat were grown on plats receiving (1) 2 tons of magnesias, (2) 2 tons of lime, and (3) no treatment. The 1916 yields of winter wheat amounted to 35.6, 33.3, and 36.3 bu. per acre, respectively, with total nitrogen contents of 1.9, 1.8, and 1.74 per cent, respectively. The spring wheat yields amounted to 29.2, 24, and 27.1 bu. per acre, with nitrogen contents of 1.77, 1.77, and 1.65 per cent, respectively.

Barley was grown on plats receiving humogen (bacterized peat) for comparison with its equivalent in farmyard manure. Yields resulted of 41.8 bu. per acre for farmyard manure, 34.7 bu. for humogen, and 32.2 bu. for the untreated check.

The total yield of hay for a clover and grass mixture containing "wild" white clover for the 4 years 1913-1916 amounted to 22,628 lbs. per acre, as compared with a yield of 20,239 lbs. from a mixture containing "ordinary" white clover.

Variety tests with alfalfa on large plats are reported for the 4-year period 1912-1915, with the Russian (Europe) giving the highest yield, 32,979 lbs., when sown alone and 31,644 lbs. when sown with barley as a nurse crop. Small plats of Sterling Montana, Sterling North Dakota, and Grimm alfalfas yielded 67.5, 85, and 91 lbs. of hay per plat, respectively, in 1916.

Experiments on the improvement of old pastures and tests of varieties and forms of lime for grass land were continued in 1916. The highest hay yield was obtained from the plat receiving 12 tons of manure and amounted to 5,180 lbs. per acre, as compared with a yield of 4,234 lbs. from the untreated check. The results of the lime experiments were deemed inconclusive.

Live stock v. grain farming, C. G. WILLIAMS (*Ohio Sta. Bul. 328 (1918), pp. 37-53*).—This forms a preliminary report on experiments begun in 1910 on a 9-acre tract comprising a comparison of grain and live-stock systems of farming and their relative ability to maintain soil fertility. On one-half of the tract a rotation of corn, soy beans, wheat, and clover is employed, and the remaining half is farmed in live stock, using the same crops. In the live-stock system all of the crops grown except the wheat and clover seed are either fed to live stock kept in a box stall with a cement floor or pass into the manure as bedding. An average of 3.34 tons of manure has been produced each year, and this is applied to the corn area the following spring. In the grain-farming system the grain and seed crops are sold and all of the roughages, including corn stover, soy bean and wheat straw, and clover, returned to the soil. In addition both tracts of corn receive 400 lbs. of acid phosphate and 2 tons of ground limestone per acre, and both wheat tracts receive 300 lbs. of acid phosphate per acre. The areas are drained and receive identical treatments as to cultivation and seeding.

The results of the experiments are reported for each crop and by sections or plats, showing the yields and the gain or loss in the live-stock system as compared with grain farming for each year of the 8-year period 1910 to 1917, inclusive. The average gains in grain yields for live-stock farming have been as follows: Corn, 6.61 bu.; soy beans, 2.89 bu.; and wheat, 3.66 bu. By dividing the crops grown on each section into two periods, the same crops having been grown in each period, the average gain of live-stock farming over grain farming was found to be 18.2 per cent for the first period and 7.2 per cent for the second period. A study of the nitrogen balance in the soil under the two systems showed a net gain per acre per rotation of 38 lbs. of nitrogen for grain farming and 69.24 lbs. for live-stock farming.

The labor requirements in live-stock and grain farming are compared and the relative profits of the two systems briefly discussed, but no conclusions are reached.

Report on the breaking up of grass land in England and Wales in the harvest year, 1916-17, T. H. MIDDLETON and R. G. WHITE (*Bd. Agr. and Fisheries [London], Misc. Pub. 19 (1917), pp. 37*).—This presents a summarized report of replies to inquiries from 55 counties in England and Wales on the breaking up of long-established grass lands in an effort to increase the total food production of Great Britain.

Practically 80 per cent of all attempts were reported as successful in obtaining profitable crop production on sod land. Approved methods of soil preparation and fertilization for various soil types are briefly outlined.

The breaking up of grass land, T. H. MIDDLETON (*Jour. Bd. Agr. [London], 24 (1917), No. 6, pp. 605-614*).—A partial reprint of the report noted above.

A new case of metaphanic variation in grasses and its significance, J. DUFRENOY (*Jour. Wash. Acad. Sci., 7 (1917), No. 17, pp. 535-537*).—The author reports the careful examination of hundreds of *Dactylis glomerata* and *D. glomerata ramosa* in a meadow at Barèges, Hautes-Pyrénées, France, which resulted in the discovery of (1) two inflorescences bearing sterile spikelets analogous to the sterile ear of *Zea tunicata*, described by Collins (*E. S. R., 37, p. 536*), and (2) a case of metaphanic variation which revealed ancestral characters. These variations are described as follows:

"Green foliage organs, 23 to 25 mm. long, developed between the glumes, some of which yielded ♂ and ♀ reproductive organs. Some of the foliage organs enclosed normal, rudimentary, or abnormal stamens and pistils, or rudimentary leaves developed where pistils should have been. . . . Successive transverse sections displayed all gradations in the forms of ♂ reproductive

organs from the microsporangia of thallophytes to the stamens of flowering grasses.

"Twelve microscoporangia were imbedded in the parenchymatous tissue at the base of the foliage organ, which was thus a true homologue of the thallus of nonflowering plants. Some of these microsporangia were rudimentary and contained cells scarcely different from the parenchymatous neighboring cells, while others contained pollen grains surrounded by nutritive cells. In the upper sections these microsporangia became more and more individualized and were freely grouped two by two as stamens."

From the observations recorded it is concluded that "organs of grasses were at first all fertile, but most of them became sterile under the pressure of ecologic factors. The vegetative activity overshadowed the reproductive activity and most organs become assimilating organs, viz, leaves. A few remained fertile and responded in diverse ways to their reproductive specialization, attaining their greatest differentiation in ordinary maize."

Grasses and leguminous crops in New York State (*N. Y. Dept. Agr. Bul. 87 (1916)*, pp. 2707-2992; figs. 127).—This is a compilation of information relative to the production of the principal hay and pasture grasses and of leguminous and nonleguminous forage crops in New York, together with notes on the disease and insect enemies of timothy, alfalfa, and clover.

Midsummer forage crops, C. G. WILLIAMS (*Mo. Bul. Ohio Sta., 3 (1918)*, No. 6, pp. 169-172, figs. 2).—Soy beans, millet, Early Amber sorghum, and Sudan grass are recommended as valuable emergency crops for seeding during June to furnish dry forage for winter feeding. Brief notes are presented on methods of seeding, and suitable varieties of soy beans and millet are indicated.

Selecting cover crops for fall planting, F. A. WELTON (*Mo. Bul. Ohio Sta., 3 (1918)*, No. 7, pp. 209-212, figs. 5).—This presents a brief summary of tests with 14 different leguminous and nonleguminous cover crops and 6 combinations of crops seeded during midsummer in corn in connection with experimental work noted on page 531. The observations were made with particular reference to winterkilling, and covered a period of 9 years.

Hairy vetch was found to be the best legume, and rye the best nonlegume, while a mixture of the two also gave good results. Rape is said to have proved satisfactory in favorable seasons.

Food needs for 1919: Fall-sown wheat and rye (*U. S. Dept. Agr., Office Sec. Circ. 103 (1918)*, pp. 13).—As a part of the agricultural program for the period beginning with the autumn of 1918, recommendations are made for increasing the winter wheat acreage by from 7 to 12 per cent, for the country as a whole, over the acreage sown last fall, and for increasing the rye acreage by about 8 per cent. Tabulated statements are presented showing the increases suggested for each State. Cultural notes are included.

A forgotten cereal of ancient America, W. E. SAFFORD (*Separate from Proc. Internat. Cong. Amer., 19 (1915)*, pp. 236-297, pls. 2, figs. 4).—The author discusses the ceremonial and economic uses of a white-seeded *Amaranthus*, first described by Watson under the name of *A. leucocarpus*, among the Indians of Mexico and the southwestern United States. Notes on the methods of cultivation and harvesting, and the preparation of the seed for food in North and South America, Asia, and Africa, are included.

The agricultural species of bent grasses, C. V. PIPER and F. H. HILLMAN (*U. S. Dept. Agr. Bul. 692 (1918)*, pp. 27, figs. 11).—Part 1 of this bulletin, prepared by Piper, deals with the identity and agricultural characteristics of Rhode Island bent and immediately related grasses, namely, redtop, florin, velvet bent, and "creeping bent." Redtop, Rhode Island bent, and creeping bent are said to have been handled commercially by seedsmen in a mixture known as South

German mixed bent. It is believed that little genuine Rhode Island bent seed has been on the market for years. Since large quantities of this seed can be obtained from natural pastures in New England, it is thought that it will become an increasingly important product due to the high value of the grass for lawns and golf courses.

It is recommended that seedsmen employ the following common and scientific names for grasses described in this bulletin: Redtop, *Agrostis palustris*; Rhode Island bent and Colonial bent, *A. tenuis*; velvet bent, *A. canina*; and South German mixed bent, *Agrostis* spp. Fiorin, which is not grown in this country to any extent at the present time, was always propagated vegetatively, and its exact botanical identity is not quite clear, although it is said to be distinct from both redtop and Rhode Island bent.

Part 2 of the bulletin, prepared by Hillman, deals with the distinguishing characteristics of the seeds of the species of bent which occur in the trade. The sale of redtop seed as seed of the finer bents and the importation of seeds of the finer bents under various and misleading names are discussed. The principal impurities of both domestic and imported seed are set forth for the purpose of distinguishing imported seed from that grown in this country. It is deemed most important that, either alone or mixed, redtop seed can be distinguished with certainty from Rhode Island bent seed and from South German mixed bent seed, the principal misbranding being the substitution of redtop seed for seed of one of the other bents.

Cultivation and utilization of barley, H. V. HARLAN (*U. S. Dept. Agr., Farmers' Bul. 968 (1918), pp. 39, figs. 10*).—The soil and climatic requirements of barley are discussed, and the field practices and cultural methods employed in its production are described in detail. The utilization of the crop for human food and as feed for stock is outlined.

Barley regions in the United States differing in economic, cultural, and varietal aspects are designated as arid or western, humid-spring or northeastern, and humid-winter or southeastern. The predominant types deemed best for each region are said to be the Coast for the arid region, the Manchuria and Oderbrucker for the humid-spring region, and the Tennessee Winter for the humid-winter region. Other varieties have been found to be particularly suited to more restricted localities. Barley diseases are briefly noted with special reference to covered smut and its prevention.

Influence of position of grain on the cob on the growth of maize seedlings, B. H. HALSTED and E. J. OWEN (*Jour. Amer. Soc. Agron., 9 (1917), No. 6, pp. 267-274*).—This paper, a contribution from the New Jersey Experiment Stations, reports observations on the relationship of the position of the grain upon the cob to weight of grain, specific gravity of grain, emergence of seedlings, viability of seed, weight of seedlings, length of seedlings, and variability in length. Five ears from each of 20 representative varieties and crosses of corn were employed in the experiment, the grain from each ear being divided into 10 equal lots, each representative of a zone of the ear ranging from butt to tip. The average weight of the grains in each zone of 2 of the 5 ears was determined and then 25 kernels from each lot planted an inch deep in a greenhouse bed. The kernels for planting were taken at random, except that in the butt and tip zones the smallest, perfect kernels were used. The plants were harvested after 17 days. The emergence of the tips of the seedlings was recorded daily and viability and weight and length of seedlings determined at harvest time.

The results obtained are discussed for each character under consideration and detailed data given on the average weight of kernels and on the vigor of

the seedlings as indicated by their live weight. The average results of the seven characters studied rank as follows:

Relative rating of different zones of the corn ear as regards various characters.

Character.	Zones.									
	1 (butt).	2	3	4	5	6	7	8	9	10 (tip)
Weight of grain.....	9	10	8	7	6	5	4	3	2	1
Specific gravity.....	4	5	5	5	9	10	6	3	3	1
Emergence.....	1	10	9	8	6	7	5	2	2	3
Viability.....	1	3	4	10	7	6	6	8	4	2
Vigor.....	2	3	8	10	6	5	7	5	3	1
Length of seedling.....	2	3	9	10	8	7	6	5	4	1
Variability.....	10	8	3	5	4	2	6	1	1	9

The authors conclude that "a practical application of the results . . . would consist of germinating a liberal sample, say 20 kernels, from 2 rows upon opposite sides near the middle of the ear. Select only those ears that show practically 100 per cent viability and plant from only the middle of the ear—that is, reject all grains of the butt zone and of the 4 zones of the upper portion of the ear."

Experiments with single-stalk cotton culture in Louisiana, Arkansas, and North Carolina, P. V. CARDON (*U. S. Dept. Agr. Bul. 526 (1918), pp. 31*).—This reports the results of a series of 21 experiments with the single-stalk method of cotton culture, as compared with older methods, made in nine parishes and counties of Louisiana, Arkansas, and North Carolina during 1915 and supplementing similar work previously noted (*E. S. R., 33, p. 730*). The experimental work was conducted by the Bureau of Plant Industry and the States Relations Service in cooperation with farmers and was largely in the nature of a demonstration. The results obtained are discussed separately for each center, and may be briefly summarized as follows:

"The lint percentage, size of the seed, lint index (grams of lint on 100 seeds), and the grade and length of lint remained about the same for the different systems of culture. Single-stalk culture gave greater total yields in 18 of the 21 instances, greater yields at the first picking in 16 of the 21 instances, greater yields at the second picking in 9 of 11 instances, and greater yields in the only instances where third pickings were made. While some of the differences were so small as to be insignificant in themselves, there was a general increase throughout the entire series of experiments; in several instances by more than 20 per cent.

"Eliminating for the present those experiments in which it is known that the thinning of the single-stalk rows was done too late, those in which the stands were generally poor and single-stalk culture was applied to only the short spaces in the rows where the stand permitted the application of the new system, those in which there is no assurance that single-stalk culture was properly applied, and those of which the reports are defective, there remain at least five experiments (three in Louisiana and two in North Carolina) that may be considered as fairly reliable tests of single-stalk culture. The yields of seed cotton from these favored the new system by 20 to 39 per cent."

Irish potato breeding, C. C. NEWMAN and L. A. LEONIAN (*South Carolina Sta. Bul. 195 (1918), pp. 3-28, figs. 19*).—This bulletin presents a preliminary report on work with first-year seedlings of Lookout Mountain potatoes in an effort to develop a strain suited to propagation as well by seeds as by tubers. This variety is said to be unusually prolific, producing on the average 8 bu. of seed

balls per acre. Observations on vegetative growth and seed production are held to indicate that there is no correlation between these two characters, the heaviest tuber production, the greatest vegetative growth, and the largest seed production usually occurring in the same plant. While the time of planting apparently affected the amount of vegetative growth and tuber production, it seemed to have no influence upon the blooming and seeding of this variety.

The seeds were harvested during October, 1916, sown in beds in the greenhouse in February, 1917, and later transferred to the field. Variations observed in the seedlings are briefly discussed and said to be strongly indicative of a hybrid origin of the seed. The seedlings possessed from 2 to 4 seed leaves and ranged from single slender vines to very stocky and profusely bunched plants. A total of 1,916 seedlings was harvested, and the seedling tubers were classified according to yield, size, color, and condition. The predominant color of the tubers was cream, as against pink and cream with pink eyes. The average weight per tuber was about 0.5 oz., and the average number of tubers per hill was about 22.

Color variation in the potato blossom, J. F. LUNDBERG (*Sveriges Utsädesför. Tidskr.*, 27 (1917), No. 1, pp. 43-45).—The observations of Wacker¹ upon the appearance of new lines with variations in flower color within vegetative lines of potatoes led the author to present similar observations from his own studies.

A new vegetative line obtained from an apparently white-flowered plant of von Lochow Wolthmann No. 34 is described, the flowers of which were also white. In further observations with certain flowers, however, traces of the red color of the mother variety still persisted, and it was concluded that in reality it was only a question of indefiniteness of the flower color. That this may also appear in other varieties was demonstrated by the magenta flower color of the Prof. Nilsson von Nolc variety, which in certain years was so completely changed into white that in many plants none at all, and in some only traces, of the true reddish color was to be found. According to the author's observations, other characteristics of the potato plant, such as size and form, could be attributed to similar accidental modifications.

Seed potato experiments and variety studies, T. C. JOHNSON and J. T. ROSA, JR. (*Virginia Truck Sta. Bul.* 24 (1917), pp. 509-523).—Experimental work conducted at Norfolk and on the Tasley substation is described, comprising tests with seed potatoes from different sources and with seed pieces of different sizes, observations upon the relation of the size of seed piece to the number of stalks and the yield per hill and the proportion of cull tubers, and tests with early varieties.

The seed stocks tested were obtained from potatoes grown in Aroostook County, Me.; from material grown locally in the fall from northern-grown stock produced the previous year and held in storage until July, when it was planted; and from potatoes grown locally in the spring of the preceding year from northern-grown seed. Seed obtained from Maine germinated two weeks earlier than that grown in Virginia, although the latter eventually gave a slightly better stand, while seed grown in Virginia the previous spring failed to give satisfactory results. Cut seed germinated more quickly than did whole tubers. Maine seed outyielded the fall home-grown seed in every instance at the first harvest, at the second harvest the two classes were nearly equal, while at the third digging the home-grown seed heavily outyielded the Maine seed.

Tests with different-sized seed pieces were made at Norfolk during 1916 and 1917 with seed obtained from Maine and with locally-grown fall-crop potatoes

¹ Ztschr. Pflanzenzücht, Vol. 4, No. 3.

of the previous year. The results are held to indicate the advisability of using larger seed pieces than are now generally employed. The continued use of small home-grown tubers for seed is deemed inadvisable. In similar tests conducted at Tasley in 1917 with fall home-grown seed, the best results were obtained from 1.8-oz. tubers planted whole. Larger tubers appeared to give smaller returns when planted whole.

Plants grown from whole seed at Norfolk showed more stalks than did the plants from cut seed, the average number of stalks increasing with the size of the seed piece. All sizes of Maine-grown seed tubers produced more stalks than did the corresponding sizes of the home-grown seed.

Of 29 varieties of early potatoes tested in 1916 only 4 yielded more than Irish Cobbler, the check variety, at the first harvest, while Eureka was the only variety which gave higher yields at the second and third diggings, though several varieties gave slightly better yields at the fourth digging. The results are held to demonstrate the superiority of the Irish Cobbler for extra early and early crop purposes, both in point of yield and in the small proportion of culls.

Physiological basis for the preparation of potatoes for seed, C. O. APPLEMAN (*Maryland Sta. Bul. 212 (1918), pp. 79-102, figs. 11*).—The author briefly discusses the rest period in potatoes, dealt with in more detail elsewhere (E. S. R., 32, p. 129), and suggests a practical method for shortening the period. The influence of terminal buds on the growth of other buds on the tuber is also discussed, and the conclusion is reached that terminal eyes suppress or retard the growth of other eyes on the tuber, the same relationship also existing between the central and lateral buds of the eye. The degree of growth inhibition is said to be influenced by the variety, the size of tuber, the vigor of terminal sprouts, and external conditions. Photographs are presented showing the operation of internal growth-inhibitory influences, which are deemed worthy of careful consideration in formulating a practical procedure for cutting tubers for seed.

Experimental work is described in which observations were made on the seed value of eyes on different parts of the tuber, the best size for seed pieces, the best method of cutting the tuber, and on the value of sprouting tubers before planting. The data are presented in tabular form and briefly discussed. Conclusions and recommendations based on the results secured may be summarized as follows:

The eyes on the stem half of the tuber were shown to be capable of producing vigorous sprouts if their connection with the terminal eyes was severed, and when all variables in seed preparation were eliminated they are said to have been as valuable for seed as eyes on the terminal half of the tuber. The vigor of the sprout was found to depend upon the size of the seed piece, and within certain limits the yield increased directly with the weight of the seed piece. A reduction in the size of the seed piece below 1.5 oz. is deemed inadvisable, while it may be profitably increased considerably above 1.5 oz. Ordinary peelings produced such weak plants and poor stands that the resulting crop did not pay for the use of the ground.

The number of eyes on the seed piece, as a rule, bore no direct relation to the number of stalks that appeared. Under normal conditions most varieties did not produce enough stalks from any sized piece to cause serious crowding if only one piece was planted in a hill and the hills were not too close together. Seeding in hills 12 in. apart is thought to be best for average conditions. In cutting tubers for seed the size of the piece is said to be of greater importance than the number of eyes per piece. Buds near a cut surface produced sprouts more quickly than did those in the middle of the piece, and the sprouts also

grew more rapidly. A graphic scheme is presented for cutting different-sized potatoes to the best advantage.

The use of seed bearing short, vigorous sprouts resulted in earlier growth and usually in higher yields than that of seed bearing only dormant eyes. The sprouting of large whole tubers is regarded as of little value, since most of the eyes remain dormant under the usual conditions of sprouting. Short vigorous sprouts should not be rubbed off before planting, but long sprouts are deemed of little value unless the tubers are "sun sprouted" or sprouted in the dark under very favorable growing conditions. When small whole tubers are to be used for seed, sun sprouting or sprouting under wet sawdust is regarded as a profitable procedure under certain conditions, especially for garden practice.

[The production of potatoes from potato skins], G. CASTALDI (*Bol. Quind. Soc. Agr. Ital.*, 22 (1917), No. 3, pp. 44-46; *abs. in Internat. Inst. Agr., Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 4, p. 599).—Experiments are briefly noted on the production of potatoes from potato skins cut into strips approximately 2 mm. (0.08 in.) thick as compared with seeding whole tubers. From 100 parts by weight of potatoes 45.5 parts of skin were obtained for planting, the remainder being available for food or commercial use.

Alternate plats of 360 square meters (3,873.6 sq. ft.) each were seeded with whole potatoes and with skins of the same variety, respectively, the rate of seeding being 24.57 kg. (54.05 lbs.) for the skins and 54.5 kg. for the whole potatoes. The average yield of all parts planted with skins amounted to 286 kg. (629.2 lbs.) and of those planted with whole potatoes to 288 kg.

The potato in Canada: Its cultivation and varieties, W. T. MACOUN (*Canada Expt. Farms Bul.* 90, popular ed. (1918), pp. 16, figs. 3).—Cultural methods and field practices deemed best for growing potatoes in Canada are outlined in a popular manner, the recommendations being based largely upon experimental work conducted at the Central Experiment Farm during the past 30 years, as reported from time to time (*E. S. R.*, 38, p. 634), together with the results obtained in similar work done elsewhere. Measures for protecting the crop from injurious insects and fungus diseases are described, and brief notes are presented on digging potatoes, storage, irrigation, and the cost of production. Varieties are recommended for different sections of the country.

[Fertilizer experiments with rice], A. W. K. DE JONG and C. VAN ROSSEM (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab.*, No. 16 (1917), pp. 46, figs. 3).—Extensive fertilizer experiments with rice during 1916 are reported, and included a comparison of ammonium sulphate, calcium nitrate, and sodium nitrate, tests with molasses, studies of the effect of sulphuric acid on rice production, a comparison of the immediate and after effects of rock phosphate with those of acid phosphate, tests with more frequent applications of acid phosphate, and a comparison of slaked lime with calcium carbonate.

It is concluded that calcium nitrate is nearly equal to ammonium sulphate in stimulating rice production, although its effects are not quite so apparent, that late applications of sodium nitrate give good results, that molasses is unfavorable for rice production, that the use of sulphuric acid had no harmful influence upon rice, that a three-fold application of rock phosphate appeared to be about equivalent to one application of double superphosphate, that more frequent applications of acid phosphate gave no significant increase in yield, and that calcium carbonate appeared to stimulate rice production.

Growing grain sorghums in the San Antonio district of Texas, C. R. LETTER (*U. S. Dept. Agr., Farmers' Bul.* 965 (1918), pp. 12, figs. 4).—Based on experimental work done on the San Antonio Experiment Farm, the growing of

grain sorghums in this region is recommended as a substitute for, or supplement to, the grain crops usually grown. Average yields of oats, corn, and Dwarf milo grown in rotation from 1911 to 1917, inclusive, amounted to 13.3, 26, and 30.4 bu. per acre, respectively. Dwarf milo and feterita are deemed best because of their early maturing qualities which enable them to escape the ravages of the sorghum midge. Directions are given for growing the crop.

How to use sorghum grain, C. R. BALL and B. E. ROTHGEB (*U. S. Dept. Agr., Farmers' Bul. 972 (1918), pp. 18, figs. 7*).—The value of sorghum grain as stock feed and as human food is discussed. The grain is said to have about 90 per cent of the feeding value of corn, to be relished by stock and poultry, and to be suitable for use as human food in every way that corn meal is used. The necessity of thorough drying and cleaning of thrashed grain is emphasized, and storage in well-ventilated bins is recommended. Directions for such a bin are included.

Something about sugar: Its history, growth, manufacture, and distribution, G. M. ROLPH (*San Francisco: John J. Newbegin, 1917, pp. XIX+341, pls. 147, figs. 4*).—The author gives a comprehensive account, profusely illustrated, of the history of sugar production from cane and beets in different parts of the world and describes in detail the various steps in preparing the commodity for use.

Analysis of canes damaged by fire, A. URICH (*La. Planter, 59 (1917), No. 6, p. 32*).—An analysis of juice from canes damaged by fire and ground from 1 to 10 days afterwards is presented and compared with an analysis of sound cane from the same district.

The normal juice varied in purity from 82.8 to 97.1 per cent, in sucrose from 16.48 to 18.36 per cent, and in glucose from 1.28 to 1.67 per cent. One day after the fire the juice from the damaged cane showed 85 per cent purity, 16.92 per cent sucrose, and 1.47 per cent glucose, while on the tenth day after the fire analysis showed 76.9 per cent purity, 15.69 per cent sucrose, and 2.04 per cent glucose.

Sweet potato storage, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 970 (1918), pp. 27, figs. 15*).—This describes in detail successful types of sweet potato storage houses and their construction. It presents a list of materials required for houses of different sizes; discusses the utilization of abandoned tenant houses, warehouses, etc., for storing sweet potatoes; indicates the varieties deemed best for market; outlines proper methods for handling the crop from harvesting to marketing; and gives directions for the use of outdoor cellars and banks for storage purposes for those growers unable to build storage houses.

Tobacco seed, H. JENSEN (*Proefstat. Vorstenland. Tabak [Dutch East Indies], Meded. 28 (1917), pp. 53-87, pls. 3*).—General characteristics of tobacco seed are fully discussed and considerable tabulated data presented comparing the value of seed from large and small seed pods and of ripe and unripe seed. The effect of pinching out the poorly developed flowers of the clusters upon the leaf quality of seed plants and upon seed production was also noted. The value of well-cleaned seed is emphasized. A device used at the station for cleaning seed by means of an air current is described and illustrated.

Velvet beans, S. M. TRACY and H. S. COE (*U. S. Dept. Agr., Farmers' Bul. 962 (1918), pp. 1-30, 37, figs. 14*).—These pages discuss the origin and distribution of velvet beans in the South and present brief descriptions of the principal varieties. Cultural methods and field practices employed in growing the crop are outlined in detail, and the utilization of the crop for hay, as a smothering crop, as silage, for grazing purposes, and for soil improvement is indicated. A section on insect pests is included.

Purple vetch, R. McKee (*U. S. Dept. Agr., Farmers' Bul.* 967 (1918), pp. 12, figs. 8).—This describes the adaptations and the production of purple vetch (*Vicia atropurpurea*), with particular reference to its use as a green manure crop in the southwestern part of the United States and as a seed crop in western Oregon. It is said to be less winter hardy than either common or hairy vetch.

The color classification of wheat (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 6, pp. 281–284).—A scheme of classification proposed by a committee of the Minnesota Section of the American Society of Agronomy, consisting of H. K. Hayes, C. H. Bailey, A. C. Arny, and P. J. Olson, is briefly reviewed.

The scheme consists of two columns headed Pigmentation and Physical Condition or Density. Under pigmentation the terms “red,” to denote the presence of a brownish-red pigment in the bran layer, and “white,” to denote the almost total absence of pigment, are to be used. Red may be modified by the term “light” when the degree of pigmentation is less than normally occurs in red wheats. Under physical condition or density it is proposed to employ four terms, denoting the several gradations of endosperm density, namely, corneous, subcorneous, substarchy, and starchy.

A new wheat for Kansas, W. M. JARDINE (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 6, pp. 257–266).—A new wheat strain, previously referred to (E. S. R., 36, p. 131), and known as Kanred, the product of a single-head selection from Crimean (No. 1435 of the Office of Cereal Investigations, U. S. Department of Agriculture), is described.

The variety was developed in 1906 by the department of botany, Kansas State Agricultural College, and has been grown on the agronomy plats of the Kansas Station since 1910 and since 1914 at the Hays, Colby, and Garden City substations and in cooperation with farmers throughout the hard winter wheat belt. Yield and other agronomic data relative to Kanred, Turkey, and Kharkov wheats from 1911 to 1916, inclusive, are tabulated, together with data from milling and baking tests at Manhattan from 1912 to 1915, inclusive.

Kanred is described as “a hard winter variety, characterized by the presence of awns, whitish, glabrous glumes, and reddish grain of the well-known Crimean or Turkey type.”

Average yields for the period of 1911–1916 at Manhattan amounted to 31.1 bu. for Kanred, 26.5 for Turkey, and 25.9 for Kharkov. Average yields at Hays for 1914 and 1916 were 31 bu. for Kanred and 28 bu. for Turkey. At Garden City Kanred, Turkey, and Kharkov gave average yields of 16.3, 14.6, and 14.4 bu. per acre, respectively, for 1915 and 1916, while at the Colby substation Kanred gave an average yield of 38.5 bu. and Turkey 31.3 bu. for the same period. In 54 cooperative tests Kanred has given an average increase of 4.4 bu. per acre over the local strains.

It was concluded from observations at Manhattan that Kanred headed and ripened on the average one day earlier than Turkey and more than one day earlier than Kharkov. The new variety is also deemed resistant to winter injury, 90 per cent of the Kanred plants surviving the winterkilling which occurred in 1912 as compared with 80 per cent for Turkey and 77 per cent for Kharkov.

It is concluded from the milling and baking tests that Kanred compares favorably with Turkey and Kharkov in all essential points, appearing to be even superior to the standards in protein and gluten content.

The “hoop” method of harvesting experimental plats is briefly noted, whereby 10 areas on each plat are inclosed by a hoop of approximately 42 in. in diameter, or a total area of 0.05 acre, and harvested. This method is deemed to be as accurate as harvesting the entire plat.

Fertilizing the wheat crop, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 7, pp. 199-203).—This briefly reviews the results of fertilizer tests with wheat made in 12 counties in Ohio for periods ranging from 1 to 24 years. The wheat was grown in rotations in which it followed corn, oats, or soy beans and was in turn followed by clover or clover and timothy.

An average increase in yield was obtained of more than 4 bu. per 100 lbs. of acid phosphate used alone. With the addition of muriate of potash to the acid phosphate, a further increase of 2.4 bu. per 100 lbs. of muriate was secured, and with the addition of nitrate of soda an increase of 2.97 bu. per 100 lbs. of nitrate over acid phosphate alone. The hay crops following the wheat also showed increased yields amounting to 542 lbs. per 100 lbs. of acid phosphate used alone, 1,408 lbs. more for the addition of 570 lbs. of muriate of potash, and 2,478 lbs. for the further addition of 1,176 lbs. of nitrate of soda. Even at pre-war prices of fertilizers, however, the increased yields obtained from the use of potassium and nitrogen in addition to phosphorus were had at a lower net gain than that secured from the use of acid phosphate alone. It is suggested that manure be largely employed as the carrier of potash and nitrogen and that it be reinforced with acid phosphate applied separately or mixed with the manure.

Wheat experiments, season 1916, A. E. V. RICHARDSON (*Jour. Dept. Agr. Victoria*, 15 (1917), No. 4, pp. 246-254, figs. 5).—Variety and fertilizer tests with wheat at numerous experimental centers are reported in continuation of work previously noted (*E. S. R.*, 36, p. 437).

Federation, Dart Imperial, and Yandilla King gave the highest average yields in 1916. Fertilizer tests indicated that the best results were secured with liberal applications of acid phosphate.

The handling and storage of spring wheat, C. H. BAILEY (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 6, pp. 275-281, figs. 5).—Investigations by the Minnesota Grain Inspection Department laboratory and the State Boards of Grain Appeals made in cooperation with the division of agricultural chemistry of the University of Minnesota, are noted. About 20 lots of wheat stored in bulk, having a moisture content of from 12.76 to 17.45 per cent, were employed to ascertain the percentage of moisture which spring wheat may contain without heating in storage. The observations were made on no less than car-load lots and covered a period of two summers and the intervening winter. Data are briefly reviewed on the relation of the rate of heating to moisture content, air temperature, location of the bin, and the original temperature of the grain, and additional data noted on changes in temperature of the grain at different depths.

The material of which the bin was constructed affected the keeping qualities of damp grain in the proportion that it afforded heat insulation. The four principal materials used in bin construction are ranked in heat-insulating value by the leading elevator construction companies of Minneapolis as follows: Hollow tile, wood, concrete, and steel.

It was concluded that handling wheat in bulk introduces certain difficulties not met with when it is handled in sacks. Wheat harvested before entirely ripe undergoes a "sweat" either in the shock, stack, or bin, but if normally dried this sweating is said to improve the baking qualities of the flour. The maximum limits of moisture which hard spring wheat may contain without danger of heating in a temperate climate are said to vary from 14.5 to 15.5 per cent. Whether actual heating occurs or not "depends upon several factors, including the hardness of the kernels because of the relation of kernel density to gluten content, the size or dimensions of the bulk, temperature of the atmosphere, initial temperature of the grain, location and consequent exposure

of the bin, and the material of which the bin is constructed." See also a previous note (E. S. R., 38, p. 588).

Seed tests made at the station during 1916 and 1917, M. T. MUNN (*New York State Sta. Bul.* 446 (1918), pp. 53).—Tabulated data are presented showing the results of purity tests of 906 official samples of agricultural seeds collected during the seasons of 1916 and 1917, also a report on voluntary examinations of 1,251 samples received from correspondents. Violations of the seed law were found in 5.6 per cent of the official samples analyzed, while the voluntary samples are said to have shown a decided lack of uniformity in labeling.

Some farm weeds of Sind, A. M. Kazi (*Poona Agr. Col. Mag.*, 8 (1917), No. 3, pp. 179-182).—Some of the common weeds occurring in the Province are listed, briefly described, and the local forage value noted.

HORTICULTURE.

American horticulture, G. MOLON (*L'Orticoltura Americana. Milan: Soc. Ort. Lombardia*, 1918, pp. XI+287, figs. 287).—An account of American horticulture, based on an inspection trip in the United States and Canada conducted at the request of the Italian Imperial Minister of Agriculture, Industry, and Commerce. Information, illustrations, and statistical data are given relative to various phases of horticulture in this country, including educational institutions, botanic gardens, experiment stations, various cultural industries, and the commerce in horticultural products.

Proceedings of the American Society for Horticultural Science, 1917 (*Proc. Amer. Soc. Hort. Sci.*, 1917, pp. 206, pls. 2, figs. 8).—In addition to the routine report, reports are given of the following addresses and papers presented at a special meeting of the society, held in Boston, November 2, and at the annual meeting, held in Pittsburgh, December 27-29, 1917: Observations upon Summer Pruning of the Apple and Peach, by M. A. Blake (pp. 14-23); A Plan for Co-operative College Training in Practical Horticulture, by E. S. Brown (pp. 23-30); The Production of Self-fertile Muscadine Grapes, by C. Dearing (pp. 30-34); Methods in Pure Line Selection Work with Potatoes, by O. B. Whipple (pp. 34-38); Some Correlations in Potatoes, by W. Stuart (pp. 39-45); Bordeaux Spraying for Potatoes in the Corn Belt, by A. T. Erwin (pp. 45-50); Experiments in Selecting Tomatoes for Wilt Resistance (abs.), by C. E. Durst (p. 51); Commercial Evaporation and Dehydration of Fruits and Vegetables, by E. L. Kirkpatrick (pp. 52-55); Correlations Between Fruit and Foliage in Strawberries, by B. S. Pickett (pp. 56-59); An Investigation of the Interrelation of Stock and Scion in Apples, by J. K. Shaw (pp. 59-65); Notes on the Nomenclature and Classification of Currant Varieties, by P. Thayer (pp. 65-70); Variation in Apples as Determined by the Position of the Fruit in the Fruit Cluster, by O. B. Whipple (pp. 71-73); Color Development and Maturity of a Few Fruits as Affected by Light Exclusion, by E. L. Overholser (pp. 73-85); Factors Influencing Rate of Discharge and the Distribution of Spray Nozzles, by H. L. Crane (pp. 85-92); The Effect of Adjacent Leaf Area on the Sugar Content of Oranges, by J. E. Coit (pp. 92, 93); Experimental Work on Self-fertility of the Apple, by W. H. Alderman (pp. 94-101); Physiological Aspects of Self-fertility of the Apple, by L. I. Knight (pp. 101-105); Winter Injury to Cherry Blossom Buds, by R. H. Roberts (pp. 105-110); Federal Point of View of Demonstration Work in Horticulture and Pomology, by C. P. Close (pp. 110-114); Factors Necessary for Successful Extension Work in Pomology, by R. W. Rees (pp. 114-118); The Role of Soil Temperature in Tree Growth, by J. Oskamp (pp. 118-126); Methods in Breeding Peaches, by C. H. Connors (pp. 126, 127); Experiments in Horticultural Teaching, by W. L.

Howard (pp. 128-130); Report of Committee on Undergraduate Work, by B. S. Pickett (pp. 130-132); Methods of Providing Practical Work in Horticultural Courses, by S. W. Fletcher (pp. 133, 134); Courses in Pomology at Cornell University, by W. H. Chandler (pp. 135-137); Pomological Field Laboratories, by E. W. Bailey (pp. 138-140); Report of Committee on Graduate Work, by M. J. Dorsey (pp. 140-147); Olericulture as a Field for Investigation, by T. C. Johnson (pp. 147-153); The Planning of an Experiment for the Fertilization of Vegetables, by C. E. Myers (pp. 153-156); Planning an Experimental Project, by W. L. Howard (pp. 156-160); Report of the Committee on Research and Experimentation, by H. J. Webber (p. 160); The Stimulation of Research, by H. J. Webber (pp. 160-163); Report of the Experimental Work in Floriculture, by A. C. Beal (pp. 164-168); Report of the Committee on Research and Experimentation, by R. L. Watts (pp. 168, 169); Report of Committee on Variety Testing, by J. H. Gourley (pp. 169-178); Report of the Committee on Score Cards for Vegetables, by W. W. Tracy, sr. (pp. 178-180); and The Effect of Soil Conditions on the Nitrogen Content of the Head Lettuce Plant, by H. A. Noyes and C. B. Sayre (pp. 180-183).

[Report of horticultural investigations] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 43 (1917), pp. 43-46, fig. 1).—A brief statement of progress made in breeding fruits and vegetables at the Ontario Experimental Farm.

As a result of strawberry breeding work started in 1912 several thousand seedlings have been fruited. Of the selected seedlings fruiting in 1917 four varieties appear worthy of introduction. Approximately 1,000 crossbred seedling apple and pear trees are being grown to the fruiting age. Twelve hundred apple and 100 pear seedlings grown from Russian seed of hardy varieties are being fruited with the view of securing hardy fruits for the North.

Considerable progress has been made in breeding celery, cabbage, carrots, beets, and onions. Small supplies of superior stock seed of these vegetables have been raised with the view of producing future seed supplies for the Dominion.

Care of the garden in hot weather, J. W. LLOYD (*Illinois Sta. Circ.* 224 (1918), pp. 4).—This circular contains suggestions for the cultural treatment of different vegetables during hot weather.

Some tests of garden vegetables in Singapore, C. F. BAKER (*Gardens' Bul. Straits Settlements*, 2 (1918), No. 1, pp. 6-13).—Acclimatization tests of a number of varieties of vegetables conducted in the Economic Garden in Singapore are here reported.

Comparison of percentages of nitrogen in tops and roots of head lettuce plants, H. A. NOYES (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 621-624, figs. 2).—Analyses made in a preliminary investigation of the nitrogen content of head lettuce being grown in the greenhouse at the Indiana Experiment Station are here reported. The plants were grown in bank sand containing very little available plant food, in a mixture of bank sand and partially rotted horse manure at the rate of 3 bu. of sand to 2 bu. of manure, and in brown silt loam which produces good crops in the field.

The nitrogen content of the plants varied considerably on different soils, with different fertilizer treatments on the same soil, and with the same fertilizer treatment on different soils. The soil had a greater effect on the nitrogen content of the plants (both tops and roots) than the fertilizer treatments did. The fertilizer treatments varied the nitrogen content most on the bank sand, which was lowest in plant food, and least on the bank sand and manure mixture, which was highest in plant food.

The percentage of nitrogen in the tops of the plant does not tend to bear a constant relation to that in the roots. With the percentage of nitrogen in the

roots taken at 100 the closest ratio obtained was 105 parts in the tops. The widest ratio was 236 parts in the tops.

The variations found in this preliminary study were so large that further work is being done to ascertain the optimum analyses for the head lettuce plant.

Home fruit grower, M. G. KAINS (*New York: A. T. De La Mare Co., Inc.*, 1918, pp. 213, figs. 139).—A treatise on amateur fruit growing, the successive chapters of which discuss choosing varieties; beauty, comfort, and utility; laying out the plantation; home orchards in the South; buying the plants; soil, fertilizers, situations, and cover crops; summer care of plantation; dwarf fruit trees; insect and disease control; storage of fruits; the various species of fruits; diverse species of nuts; and home fruits as educators of public taste.

Marketing berries and cherries by parcel post, C. C. HAWBAKER and C. A. BURMEISTER (*U. S. Dept. Agr. Bul. 688 (1918), pp. 17, figs. 10*).—Experiments conducted by the Bureau of Markets of the U. S. Department of Agriculture in cooperation with the Post Office Department, the results of which are here summarized, indicate that under proper methods of packing certain of the small fruits, such as strawberries, blackberries, huckleberries, and cherries, may be shipped by parcel post. Experiments in shipping raspberries have not been favorable. The bulletin contains suggestions relative to methods of shipping these fruits. Whether such shipments will prove profitable to the grower can be decided only by consideration of various factors, such as the cost of marketing by this method and the net return as compared with other methods of marketing, the quantity of berries to be marketed, location of shipper with reference to the post office and market, and the ability of the shipper to develop and maintain a mail order business.

Newer varieties of strawberries, O. M. TAYLOR (*New York State Sta. Bul. 447 (1918), pp. 55-78, pls. 9; abridged ed., pp. 3-10*).—In continuation of a previous report (*E. S. R.*, 33, p. 142) this bulletin gives the results of tests of recent strawberry introductions conducted on the station grounds. The varieties tested are described in detail and are also grouped according to different characteristics, such as very productive varieties, shy-plant producers, varieties susceptible to leaf spot, flowers imperfect or pistillate, very early, medium early, late, and very late, varieties with berries very firm, and generally desirable varieties.

As the result of breeding work conducted at the station, thousands of plants have been under observation. In the spring of 1917 plants of eight kinds that have been named were distributed in different parts of the State for testing under varying soil and climatic conditions. Full descriptions are included of these seedlings.

Further studies of the rots of strawberry fruits, N. E. STEVENS and R. B. WILCOX (*U. S. Dept. Agr. Bul. 686 (1918), pp. 14*).—In continuation of previous work (*E. S. R.*, 37, p. 351), the results are given for the season of 1917 of field investigations conducted in a number of States. In addition to a study of the strawberries in the field, experimental shipments and observations of the fruit in various markets were made. A bibliography of literature cited is appended. The results of these investigations are summarized as follows:

"Leak, caused by *Rhizopus nigricans*, is by far the most important rot of strawberries after picking. Losses from leak can be most effectively reduced by keeping berries at low temperatures and by handling them carefully. Berries picked in the early morning are cool and less likely to decay than those picked during the heat of the day. Adequate refrigeration greatly reduces the rate of growth of *R. nigricans* in transit. Washing strawberries to remove dirt

may have a beneficial effect if the berries are washed in clean water, handled with care, packed in the crates while still wet, and refrigeration is not too long delayed. Less bruising results if the berries are packed in boxes and then washed by dipping the entire box or by running water through it than if the berries are washed before packing and plating.

"*Botrytis* sp. is characteristically a field rot of strawberries. It is most abundant and serious in the field under conditions of excessive moisture. Berries affected with *Botrytis* can be recognized at the time of picking and packing and should not be included in fruit intended for market. Although *Botrytis* is able to grow at low temperatures and frequently produces abundant aerial hyphae on strawberries in refrigerator cars, its growth on ripe berries is so slow that it is of minor importance as a cause of rot in transit. It is evident that the entrance of *Rhizopus* into strawberries and the production of leak are not dependent upon previous infection by *Botrytis*."

Influence of the annual shoot pruning on the vitality of the plant, E. MEN (Compt. Rend. Acad. Agr. France, 4 (1918), No. 28, pp. 785-804, figs. 4).—Observations made by the author indicate that green shoots of the grapevine may be removed for forage purposes in the fall after the starch has migrated into the canes and roots but before the leaves have become discolored without materially injuring the vitality of the vines.

Results obtained in Italy from the sowing of caprifig seed, B. LONGO (Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 27 (1918), I. No. 1, pp. 55-57; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 5, p. 571).—The author cites the experience of other investigators in which it was found that when seeds of the common edible fig are sown both edible figs and caprifigs are obtained. In 1912 he sowed both wild and cultivated caprifig seed. The plants obtained began to bear fruit in 1917 and proved to be partly edible figs and partly caprifigs. Thus it appears that the seed of the caprifig, like those of the common edible fig, give both edible and caprifigs.

Diseases and pests of cacao in Ecuador and modern methods adapted to the cultivation of cacao, J. B. ROBER (Enfermedades y Plagas del Cacao en el Ecuador y Metodos Modernos Apropriados al Cultivo del Cacao. Guayaquil, Ecuador: [Author], 1918, pp. 80, figs. 22).—An account of the important diseases and pests of cacao in Ecuador, including a discussion of the adaptation of modern practices in the cultivation of cacao, translated from English by A. Pachano.

[The oil content of coconuts on heavy clay soil], J. B. HARRISON and C. B. W. ANDERSON (Rpt. Dept. Sci. and Agr. Brit. Guiana, 1916, pp. 43, 44).—Analyses of coconuts growing on heavy clay soil in the experimental fields of the Department of Science and Agriculture are reported. The data given show that the oil content of the nuts compares favorably with the oil content of coconuts grown in various other countries.

Some effects of shading lemon trees, A. D. SHAMEL, C. S. POMEROY, C. L. DYER, and L. B. SCOTT (Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, pp. 441-451, figs. 4).—In November, 1913, a tent of tobacco cloth, approximately an acre in extent, was erected over a plat of 76 Eureka lemon trees in an orchard near Corona, Cal., for the purpose of determining its value as a protection from frost. No serious frosts occurred prior to the destruction of the tent in December, 1915, but a large amount of data showing the effect of shading lemon trees was secured and is here presented in part.

Wind velocity, temperature, and relative humidity records were maintained throughout the period of observation. Wind velocity was materially reduced within the tent thereby protecting the trees and fruit from injuries such as broken branches, scarred and bruised fruits, and wilted leaves during periods of low relative humidity. The temperature records indicate that for the entire

period it was slightly warmer inside the tent than outside. If the outside temperature remained constant for a few hours the inside temperature soon reached the same point, while if the outside temperature dropped quickly and rose again in a short time the difference between the two minima was from 4 to 7° F. For the whole period the relative humidity outside the tent was slightly higher than inside. This is accounted for in part by the occurrence of frequent early morning fogs in the region of the studies which may not have readily penetrated the tent, and in part by the somewhat higher average temperature, 1.27°, inside the tent.

Soil samples to a depth of 6 ft. were taken at intervals from December, 1913, to October, 1914, usually just before the regular orchard irrigations. The average moisture content of the first 3 ft. of soil inside the tent was higher than that of the comparative soil area outside. In the lower 3 ft. the soil moisture was practically the same inside the tent as outside.

Individual yield records were kept of a number of trees included in the shaded area before the tent was erected. These data, together with data secured on yields after the tent was erected, indicate that shading did not materially increase the total production per tree but did result in a higher production of green fruits by the trees inside the tent as compared with those outside. Another effect of shading the trees was to develop a larger proportion of the crop during the winter and fall periods as compared with their production during the spring and summer period than was the case with the trees in the nonshaded plat. It is pointed out that lemons are usually sold for higher prices in the spring and summer months than during the winter months.

A maturity standard for citrus fruits, F. LÓPEZ (*Rev. Agr. Puerto Rico*, 1 (1918), No. 3, pp. 101-108).—The results are given of a study of changes taking place in grapefruit before and after maturity. The study, which was started by W. B. Cady in 1915 and continued by the author, was conducted with special reference to determining the proper time to pick grapefruit for shipment in order to comply with the Federal law relative to the ratio of sugar to acid.

Analyses made show that such varieties as Marsh Seedless and Duncan will not come to a proper state of maturity in Porto Rico until after November 15, whereas the Triumph sometimes matures in September and sometimes earlier. Practically the entire percentage of acid is formed by the commencement of maturity, although in some varieties small quantities of acid are formed after maturity.

The percentage of acid decreases gradually as the fruit matures. The total sugar content increases until the fruit reaches maturity, after which it is practically constant. The proportion of invert sugar to sucrose is constant until the fruit matures, after which the invert sugar increases and the sucrose diminishes. The solids in solution increase continually as the season progresses.

The only change of importance after the fruit is removed from the tree and during the curing process is the inversion of the sucrose.

The theory and practice of sanitary precautions in grove and packing house operations, J. C. HORROR (*Quart. Bul. Plant Bd. Fla.*, 2 (1918), No. 4, pp. 161-179).—This paper discusses the methods of preventing decay and loss of citrus fruit during the processes of picking, handling, and packing.

Growing medicinal plants in America, A. S. CUSHMAN (*Jour. Franklin Inst.*, 186 (1918), No. 3, pp. 267-278, figs. 8).—A paper on this subject presented at the meeting of the Franklin Institute, April 17, 1918, in which the author describes some of the conditions and difficulties encountered in the attempt to develop the culture of medicinal plants in America.

Sequence of the first blooming of the rose collection, spring of 1918, MARGARET V. SEXTON (*Jour. N. Y. Bot. Gard.*, 19 (1918), No. 223, pp. 149-159).—This comprises a record of the first flowering of 359 kinds of bush roses in the new rose garden of the New York Botanical Garden. The record was started primarily for comparison during subsequent years.

The small place: Its landscape architecture, ELSA REHMANN (*New York: G. P. Putnam's Sons*, 1918, pp. XXII+164, pls. 90).—With the view of pointing out the fundamentals that underlie the planning and planting of the small place, the author here discusses in detail 15 problems in landscape architecture that have been worked out by various landscape architects.

FORESTRY.

Miscellaneous conifers of the Rocky Mountain region, G. B. SUBWORTH (*U. S. Dept. Agr. Bul.* 680 (1918), pp. 44, pls. 22).—This bulletin deals with the distinguishing characteristics, forest habits, and geographic distribution of all larch, hemlock, false hemlock, incense cedar, arborvitae, and yew trees that grow naturally within the Rocky Mountain region. Keys for the identification of genera and species are included.

Utilization of elm, W. D. BRUSH (*U. S. Dept. Agr. Bul.* 683 (1918), pp. 43, pls. 4, figs. 8).—An account of the commercial species of elm with reference to the characteristics and structure of elm wood, supply and consumption, utilization by various industries, grading rules for elm, lumber and stumpage values, markets, elm in the woodlot, and classified uses of elm in different wood-using industries.

An investigation of the growth in natural second-growth teak woods in north Japara, H. BECKMAN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Boschw.*, No. 2 (1917), pp. 1-30, pl. 1).—A study of growth accretion in natural regenerated teak woods, based upon measurements of 70 sample trees which are presented in tabular form and discussed.

[Report on ornamental and economic trees], C. K. BANCROFT (*Rpt. Dept. Sci. and Agr. Brit. Guiana*, 1916, pp. 53-55).—A list is given of important ornamental and economic trees other than palms that flowered at the Botanic Gardens, Georgetown, Demerara, in 1916, including the months of flowering.

Woodlot improvement and the production of firewood, A. E. TAYLOR (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 7, pp. 215-221, figs. 3).—This paper contains practical suggestions for improving the farm woodlot, with special reference to the utilization of wood removed in improvement work as firewood.

Farm forestry in Virginia, R. C. JONES (*Va. Geol. Com., Off. State Forester Bul.* 12 (1917), pp. 60).—This bulletin points out the value of woodlands on the farm; describes the important native trees of Virginia; and discusses the essentials of good farm woodlands, improvement of farm woodlands by cuttings, harvesting of mature trees on farm woodlands, starting new trees in farm woodlands, and protection of farm woodlands. The bulletin concludes with a partial list of publications for reference.

The forests of Alexandria County, Va., W. B. DUNWOODY (*Va. Geol. Com., Off. State Forester Bul.* 13 (1917), pp. 18, pl. 1).—This embraces the results of a survey of the forests of Alexandria County, Va., and discusses the character, products, and proper management of the forests.

The forests of Nottoway County, Va., G. D. MARCKWORTH (*Va. Geol. Com., Off. State Forester Bul.* 14 (1917), pp. 8).—A survey similar to the above of the forests and forest products of Nottoway County, Va.

The forests of Chesterfield County, Va., G. D. MARCKWORTH (*Va. Geol. Com., Off. State Forester Bul.* 15 (1917), pp. 8).—A survey similar to the above of the forests and forest products of Chesterfield County, Va.

Report of the State firewarden, C. P. WILBER (*Ann. Rpt. Dept. Conserv. and Develop., N. J., 1917, pp. 103-135, pls. 2, figs. 2*).—A review of the forest fire season, including a record of forest fires for the year ended November 1, 1917.

Forest fires in Canada, 1914, 1915, and 1916, T. W. DWIGHT (*Dept. Int. Canada, Forestry Branch Bul. 64 (1918), pp. 45, figs. 17*).—A statistical account of the forest fires in various parts of the country during the three seasons, 1914-1916.

Forest legislation in Canada, 1917-18 (*Canad. Forestry Jour., 14 (1918), No. 7, pp. 1791-1793*).—A résumé of public measures in the Provinces and in the Dominion.

Forestry in Sweden, J. A. AMILON (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 11, pp. 1049-1061*).—An account of forestry in Sweden, presented under the headings of area and value of the forests, forest regions, forest administration, management of the forests, forest products, forest laws, and forestry research and instruction.

Annual progress report of forest administration in the United Provinces for the forest year 1916-17, P. H. CLUTTERBUCK (*Ann. Rpt. Forest Admin. United Prov. India, 1917, pp. [6]+45+LXX+7*).—The usual progress report relative to the constitution, management, and administration of the State forests of the United Provinces, including a financial statement for the forest year 1916-17.

All important data relative to forest areas, forest surveys, working plans, forest protection, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Report on the forest administration of the Central Provinces for the year 1916-17, M. HILL (*Rpt. Forest Admin. Central Prov. [India], 1917, pp. 5+41+XC*).—A report similar to the above relative to the administration of the State forests of the Northern, Southern, and Berar Circles of the Central Provinces for the year 1916-17.

Report on forest administration in the Andamans for the year 1916-17, F. H. CAVENDISH (*Rpt. Forest Admin. Andamans, 1917, pp. [6]+39*).—A report similar to the above relative to the administration of the State forests of the Andamans for the year 1916-17.

Annual report on the forest administration in Ajmer-Merwara for the year 1916-17, SAMBHOO DATT JOSHEE (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1917, pp. 26*).—The usual annual report (*E. S. R., 37, p. 146*).

DISEASES OF PLANTS.

A list of plant diseases of economic importance in Indiana, with bibliography, F. J. PIPAL (*Proc. Ind. Acad. Sci., 1915, pp. 379-413*).—This list and bibliography of plant diseases in Indiana is said to be intended merely as a foundation for future plant-disease surveys. With a few exceptions, the list includes all plant diseases reported in previous publications, and other diseases of which specimens have been obtained. The distribution of the diseases is usually given according to counties or to the sections of the State in which they are prevalent, or as general over the State. The diseases with their causal organisms are listed under the several hosts.

Additions to the list of plant diseases of economic importance in Indiana, G. A. OSNER (*Proc. Ind. Acad. Sci., 1916, pp. 327-332*).—This list, which is said to be supplementary to that of Pipal given above, represents collections made recently by the author and others. It is intended to add to the list from time to time until a fairly complete survey of Indiana has been made.

Work connected with insect and fungus pests and their control (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1916-17, pp. 26-29*).—Besides a report on insect pests and their control, an account is given of the third year's experiments in spraying peanuts for the rust fungus (*Uredo arachidis*). This work has led to a modification of the conclusion that the fungus can be controlled properly by two applications of Bordeaux mixture, although beneficial results followed its use in all cases.

A wilt of alfalfa is noted as commonly associated with the presence of a *Fusarium*.

Recent developments in spraying, J. H. CARMODY (*Ann. Rpt. State Hort. Soc. Mich., 46 (1916), pp. 85-100*).—Discussion is noted regarding various sprays in liquid or dust form and of their employment against fungi injurious to fruit-producing interests.

Comparative efficiency of basic and acid copper sprays, J. CAPUS (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 2, pp. 86-90*).—It is stated that Bordeaux or Burgundy mixture is completely efficacious at the moment of its application and that it remains so for some time, a 2 per cent strength of the acid form giving equally good results for both, but the efficiency of either at this strength is more rapidly lost than is that of an alkaline mixture. Acid sprays also leave larger areas of the leaf surface open to attack than do basic sprays.

A new formula for Bordeaux, G. E. SANDERS (*Canad. Hort., 41 (1918), No. 5, p. 122*).—The author gives a brief account of the successful employment of a Bordeaux mixture made up of 2 lbs. copper sulphate and 10 lbs. lime to 40 gal. water, prepared according to a method which is said to require the handling of dry materials only and also to economize time and labor.

Dusting v. spraying in Nova Scotia, P. A. MURPHY (*Canad. Hort., 41 (1918), No. 5, pp. 113, 114, fig. 1*).—The somewhat conflicting results obtained up to the time of this statement are held to indicate the necessity of experimenting throughout a number of years before deciding as to the general advantage to be derived from the dust applications as a means of controlling apple scab. Data are detailed as obtained from comparative tests of dusts of various strengths, of lime-sulphur, and of a combination of lime-sulphur and Bordeaux mixture. The extent to which scab will develop in spite of the dust depends upon the season. In all but very severe outbreaks dusting seems to be effective in the United States.

Dusting experiments in 1917, V. B. STEWART (*Phytopathology, 8 (1918), No. 2, pp. 63, 64*).—In a previous publication (*E. S. R., 36, p. 750*), the author gave an account of the successful use of finely ground sulphur and powdered lead arsenate for controlling leaf diseases of nursery stock. In 1917 the experiments were repeated, the amount of lead arsenate being reduced in one case to 5 per cent. and in another case 10 per cent hydrated lime was substituted for the lead arsenate in order to reduce the cost of the mixture.

From the results obtained in undertaking the control of *Fabraea maculata* on quince and leaf blotch of horse-chestnut trees due to *Guignardia asculi* it appears that a reduction to 5 per cent in the amount of lead arsenate did not decrease the effectiveness of the mixture. The substitution of hydrated lime for the lead arsenate, however, reduced considerably the fungicidal value of the mixture.

Dusting as means of disease and insect control, J. F. SHELDON (*Ann. Rpt. State Hort. Soc. Mich., 46 (1916), pp. 42, 43*).—The advantages claimed for the dust method are briefly noted.

Cronartium coleosporioides on *Pedicularis groenlandica*, J. R. WEIR and E. E. HUBERT (*Phytopathology, 8 (1918), No. 2, p. 63*).—The occurrence of *C. coleosporioides* on the above host is reported. In addition, it is stated that it has

been collected on *Orthocarpus luteus* and *O. purpureo-albus*, this rust being now known to occur on three genera, namely, Castilleja, Orthocarpus, and Pedicularis.

The mosaic disease of *Phytolacca decandra*, H. A. ALLARD (*Phytopathology*, 8 (1918), No. 2, pp. 51-54, figs. 2).—Attention has been previously called to a mosaic disease of the pokeweed which resembles in some respect the mosaic disease of tobacco (E. S. R., 14, p. 264). An investigation was made of the mosaic disease of pokeweed plants, and a series of tobacco plants was inoculated with the virus from pokeweed without the production of any evidence of disease.

In a study of means by which the disease might be transmitted, healthy and mosaic-diseased pokeweed and tobacco plants were grown side by side, and although aphids were active in the spread of the mosaic disease of tobacco to susceptible solanaceous plants, in no instance did the mosaic disease of pokeweed make its appearance in healthy plants until inoculated with a needle. This indicates that insects capable of acting as carriers of the infective principle were not present in the greenhouse during the time of the experiment.

Two new species of *Pestalozzia* in Tuscany, M. SAVELLI (*Bul. Soc. Bot. Ital.*, No. 6-7 (1917), pp. 62-68, figs. 8; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 9, p. 1322).—The author reports a study of a fruit disease of *Feijoa sellowiana* in the Florence Botanical Garden in the winter of 1914-15 and a leaf spot of *Quercus ilex agrifolia* near Marina di Pisa in the spring of 1917. The fungi noted as apparently causal were considered to be new species and were named respectively *P. feijoa* and *P. luca*.

Rusts of Hamilton and Marion Counties, Indiana, G. W. WILSON (*Proc. Ind. Acad. Sci.*, 1916, pp. 382, 383).—Five species are briefly noted, economic interest attaching to *Coleosporium campanulae* on *Campanula americana*, *Dicoma phlei-pratense* on *Phleum pratense*, and *D. malvacearum* on *Althaea rosea*.

Field conference of cereal pathologists, C. W. HUNGERFORD (*Science*, n. ser., 48 (1918), No. 1232, pp. 148-150).—A summary account is given of papers and discussions presented at the fourth annual conference of cereal pathologists, held at Purdue University, Lafayette, Ind., June 19 to 21, 1918.

The effect of hydrogen peroxid in preventing the smut of wheat and oats, F. J. PIPAL (*Proc. Ind. Acad. Sci.*, 1916, pp. 378-381).—In tests following up those reported previously (E. S. R., 36, p. 542), the author found that hydrogen peroxid, while harmless and rather stimulating as regards germination when applied to seed wheat and oats, was ineffective as regards freeing the seed of smut infection except when applied at concentrations which are practically prohibited by the expense of the treatment. Formaldehyde is said to be more effective and also to be the cheapest of disinfectants for seed grain.

Longevity of *Helminthosporium teres*, A. L. BAKKE (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 80).—The resistance of spores of *H. teres* to unfavorable conditions was shown in an experiment in which portions of barley stems and leaves were sterilized and afterwards inoculated with spores on January 9, 1911. The tubes were examined and transfers made November 7, 1917. Visible growth and pigmentation resulted in 24 hours in case of transfer of conidia, and evidence of growth in less than 5 days from pycnospores.

A means of controlling stalk disease of wheat, HERBERT and H. DEVAUX (*Compt. Rend. Acad. Agr. France*, 3 (1917), No. 35, pp. 992-997).—Having noted the tendency of certain strains of wheat to throw out adventitious roots above the region of the stalk attacked by stalk disease fungi, and having tested the effects of hilling up the stalks, the author reports that this plan appears to offer a means of decreasing loss from stalk disease, especially if stocks favorable to the treatment be selected. Discussion of the plan is also noted,

Can biologic forms of stem rust on wheat change rapidly enough to interfere with breeding for rust resistance? E. C. STAKMAN, J. H. PARKER, and F. J. PIEMEISEL (*Jour. Agr. Research* [U. S.], 14 (1918), No. 2, pp. 111-124, pls. 5).—The results of cooperative investigations carried on by the Minnesota Experiment Station and the Bureau of Plant Industry, U. S. Department of Agriculture, are given, in which a study was made of the possibility of breeding cereals permanently resistant to rust.

From field observations and from experimental work done in the field nursery, it is considered that rust resistance is comparable with other permanent characters and that it is not primarily controlled by seasonal conditions, soil type, geographical location, or other cultural conditions. It is considered rather an hereditary character which can not be produced by the accumulation of fluctuating variations within a susceptible line nor broken down by changes in the host or parasite. It is believed that resistance of wheat varieties may vary in different regions because of the presence of different biologic forms of rust.

The authors believe that there is little basis for the conclusion previously expressed by Evans (E. S. R., 25, p. 453) that hybrids between resistant and susceptible varieties will exert a harmful final effect by increasing the virulence and host range of stem rust.

An æcium on red clover (*Trifolium pratense*), G. N. HOFFER (*Proc. Ind. Acad. Sci.*, 1916, pp. 325, 326).—The author reports having found what he believes to have been æcia of *Uromyces fallens* on the stems and leaves of red clover.

Celery blight and its prevention, J. E. HOWITT (*Canad. Hort.*, 41 (1918), No. 5, p. 117).—The results of experiments during five years are said to show that late blight of celery can be controlled by spraying with 4:4:40 Bordeaux mixture, commencing when the plants are in the seed bed and continuing at intervals of a week or ten days, or even twice a week, if necessary. It is claimed that this can be continued until within two or three days of the time when the celery is to be harvested, as the subsequent washing removes the fungicide. Sulfocide and lime-sulphur are not recommended.

Brown rot of Solanaceæ on *Ricinus*, E. F. SMITH and G. H. GODFREY (*Science*, n. ser., 48 (1918), No. 1228, pp. 42, 43).—The authors report the occurrence of a wilt of castor beans due to *Bacterium solanacearum*. The organism isolated from the castor bean is said to behave in various media like *B. solanacearum* from other hosts, and inoculations made on tomato and tobacco produced typical wilts of these plants. As the castor bean has been found subject to this wilt, the authors suggest that this crop should not be planted on land where bacterial wilt of solanaceous plants has recently occurred.

True nature of spinach blight and relation of insects to its transmission, J. A. MCCLECKROCK and L. B. SMITH (*Jour. Agr. Research* [U. S.], 14 (1918), No. 1, pp. 1-60, pls. 12, fig. 1; *abs. in Phytopathology*, 8 (1918), No. 2, p. 74).—A preliminary report is given of investigations conducted at the Virginia Truck Experiment Station on the nature of spinach blight, its dissemination, and transmission by insects.

Spinach blight is said to be a specific disease characterized by a mottling and malformation of the leaves and a decided stunting of the growth. Diseased plants go through a number of characteristic stages and finally die. This blight may be distinguished from fungus diseases by the fact that no specific organism is known to cause it, and also that various fungi produce definite leaf spots while the blight produces gradual degeneration of the tissues.

Inoculation experiments have shown that the disease is of an infectious nature and it is apparently largely transmitted by insects. Under the conditions

under which spinach is grown in eastern Virginia, a number of species of insects are present, the most abundant being the potato aphid (*Macrosiphum solanifolii*) and the spinach aphid (*Rhopalosiphum persicae*). The potato aphid is the more important agent in disseminating the disease, and experiments with this insect have shown that the aphids carry the virus causing the disease and that the infectious entity may be transmitted by adult aphids to their offspring. Since it has been found that the causal factor of the disease may be hereditary with aphids, the authors believe that the cause of the blight possibly summers by this method. So far as experiments have gone, there is no indication that spinach blight is transmitted by seed or through the soil.

The control of aphids infesting spinach is said to offer the most immediate possibility of controlling spinach blight. Experiments in the breeding of blight-resistant spinach are in progress.

Gummosis of sugar cane and its control, J. GROENEWESE (*Arch. Suikerindus. Nederland. Indië*, 25 (1917), No. 16, pp. 597-638, pls. 9; *Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser.*, No. 6, (1917), pp. 42, pls. 9).—In a continuation of the studies previously reported (*E. S. R.*, 23, p. 851), the author states that gummosis of sugar cane is pretty generally distributed over the island of Java. Few sugar cane varieties appear to be immune to the disease, which is attributed to *Bacterium vasculare*. Outbreaks are related to the presence of soft, easily rotted plant materials in the soil. These may produce a root injury and thus constitute a factor predisposing to the disease, as well as a hindering factor to the development of the plant. The infection is less severe during the western than in the eastern monsoon and less so on heavy than on light soils. The presence of the organism in the soil is not sufficient to cause the disease in the absence of other factors. The trouble can be successfully opposed by the addition to the soil of slowly rotting material or by the use of carefully regulated amounts of more easily rotting vegetable materials.

The plant cane supply in the Java sugar industry in relation to sereh, P. VAN HARREVELD (*Arch. Suikerindus. Nederland. Indië*, 25 (1917), No. 15, pp. 557-589; *Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser.*, No. 5 (1917), pp. 33).—Sereh, or sieve tube disease, of sugar cane is an important determining factor in the demand for the importation of plant cane into Java. Each locality is subject to conditions determining the importance of the disease in that locality. Difficulties are discussed, as are cooperative and other plans proposed looking to an adequate cane supply.

Diseases of tobacco plants: Blue mold and a bacterial disease, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales*, 29 (1918), No. 2, pp. 82-88, figs. 3).—A brief discussion of blue mold (*Peronospora hyoscyami*) is given. *Bacillus solanacearum* is thought to be the causal organism in several diseases to which local names are given. *Phytophthora nicotianæ* is mentioned as being among the parasitic molds. *B. nicotianæ* causes a stem rot.

Fire blight of fruit trees, J. T. BREGGER (*Ann. Rpt. State Hort. Soc. Mich.*, 46 (1916), pp. 40, 41).—Suggestions regarding protection against fire blight of fruit trees include not only removal of diseased branches but also pruning methods designed to lessen the likelihood of infection when the disease is present on a given tree and to utilize the disinfecting properties of sunlight by admitting it to the interior of the tree.

The sources of apple bitter rot infections, J. W. ROBERTS (*U. S. Dept. Agr. Bul.* 684 (1918), pp. 26, pls. 5).—Results are given of a study of the apple bitter rot due to *Glomerella cingulata*, which is said to occur in nearly all sections of the world where apples are grown but which reaches its high point of destructiveness in the southern apple-growing regions of the United States. Spore dissemination is said to be carried on by such agencies as rain, dew, insects, and

possibly birds, wind being a negligible factor. Different varieties of apples are found to vary greatly in susceptibility to the disease. The causal organism has been found to survive the winter in mummies, bitter rot cankers, and cankers other than those of bitter rot. During the current season, the causal organism may be found on the leaves and infected fruit. Conidia on the latter are said to be the principal means by which the disease is spread after the initial infection. In addition to the apple, many other plants are subject to the disease.

For control of bitter rot, the author recommends removal of mummies and cankers supplemented by spraying. This treatment is said to have given control in orchards where in previous years spraying alone was unsuccessful.

Apple scab and its control, H. H. WHETZEL (*Canad. Hort.*, 41 (1918), No. 5, p. 121).—Summarizing the results of experimentation, the author states that during the last two seasons, which were very favorable to apple scab, it has been shown conclusively that dusting is as effective as spraying in the control of this disease. The work has demonstrated also the impossibility of preventing the primary infection, especially in rainy seasons.

Combating cherry leaf blight, H. H. WHETZEL (*Canad. Hort.*, 41 (1918), No. 5, pp. 117, 118).—In case of sweet cherry, lime-sulphur or sulphur dust applied just after the petals fall, again ten days or two weeks later, and a third time just after the fruit is gathered is said to give clean foliage throughout the average season. Sour cherry may be kept clean by employing 1:50 lime-sulphur, 5:5:50 Bordeaux mixture, or a dust application made up of 90 per cent finely ground sulphur and 10 per cent lead arsenate.

The bacterial shot-hole of peach, H. W. ANDERSON (*Trans. Ill. Hort. Soc.*, n. ser., 51 (1917), pp. 121-128).—To data taken from reports by Rolfs (E. S. R., 34, p. 248) and by Roberts (E. S. R., 37, p. 842), the author adds an account of his own observations. This disease, first described as occurring in the United States about 10 years ago, is still thought to be confined within its borders. The regular sprays used for the control of other peach diseases are not effective in connection with this trouble, but it is said that the employment of nitrogenous fertilizers greatly reduces loss from this cause.

A nonparasitic malady of the vine, F. E. GLADWIN (*New York State Sta. Bul.* 449 (1918), pp. 99-110, pls. 3).—For a number of years, observations have been conducted on a disease of grapevines first observed in 1910. Vines affected with the trouble first show a streaked pallidness of the leaves in the intervascular spaces, these areas later becoming yellow. Isolated areas of the leaf blade deaden, and when these join, a considerable portion of the leaf tissue may become functionless. As a result of the injury to the foliage, the growth is materially checked and the wood usually fails to mature well. The fruit does not color nor is the normal amount of sugar fixed, and shelling may result.

The affection manifests itself on light soils during drought and on heavy impervious soils when excessively wet. Soils deficient in organic matter contribute to the trouble.

Experiments with fertilizers failed to show any reduction in the amount of injury, but the incorporation of considerable organic matter in the soil is thought to be a possible corrective. Draining the heavy types of soil is also considered advantageous. Early spring plowing and frequent summer tillage are recommended, and affected vines should be more closely pruned than normal ones.

Nut fall and leaf droop of coconuts, T. PETCH (*Dept. Agr. Ceylon Leaflet* 6 (1917), pp. 2, pl. 1).—It is stated that after the heavy and unseasonable rains of January and February, 1917, an extensive fall of nearly mature coconuts occurred on some estates in the district lying between Galagedara and Kurune-

gala. The stalk end of the nut showed discoloration, which in some cases covered the whole of the stalk end and spread half-way to the point, showing generally a somewhat sodden appearance. The cause of the decay is said to be a *Phytophthora*. The fungus may attack the fruit stalk and cause the nuts to fall without being actually attacked.

From the same area, a drooping of the leaves which form the lower part of the crown is described. It is thought that this is only a different manifestation of the activity of the *Phytophthora* which causes the fall of the nuts.

Notes upon a market disease of limes, O. T. WILSON (*Phytopathology*, 8 (1918), No. 2, pp. 45-59, fig. 5).—A description is given of a disease of limes investigated by the author during the winter of 1916-17. The disease is said to have been very common on this fruit in the markets of Cincinnati, almost any lot of fruit examined yielding some diseased specimens. The trouble was found to be due to a fungus which grows readily on a variety of media, but no spores have been found, and until such are produced the status of the causal organism will be in doubt.

Diseases injurious to the pecan, J. MATZ (*Florida Sta. Bul.* 147 (1918), pp. 135-149, figs. 15).—Descriptions and suggestions for control, so far as definite means are known, are given for the following diseases of pecan: Scab (*Fusicladium effusum*), anthracnose (*Glomerella cingulata*), mildew (*Microspheara alni*), rosette, die-back (*Botryosphaeria berengeriana*), pink mold (*Cephalothecium* sp.), kernel spot, brown leaf spot (*Cercospora fusca*), nursery blight (*Phyllosticta caryæ*), and leaf blotch (*Gnomonia* sp.). In addition, brief descriptions are given of winter injury and injury due to salamanders and mistletoe.

The causes of silver leaf, L. PETRI (*Ann. R. Ist. Sup. Forestale Naz. Firenze*, 2 (1916-17), pp. 465-475, pl. 1, figs. 2; *abs. in Internat. Inst. Agri. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 8, pp. 1196, 1197).—The author maintains that besides *Stereum purpureum*, claimed by Güssow (E. S. R., 28, p. 348) to cause silver leaf of various trees, other conditions may give the same effects. Among the conditions effective in this way are mentioned the presence of calcium oxalate crystals in the subepidermal and intercellular spaces and the separation of the cuticle from the palisade cells. It is thought that underlying these changes and also involved in the parasitic form of the disease is a process of hydrolysis of the pectic substances of the walls of the epidermal cells. This is thought to be due to the action of a pectinase, the formation and abnormal secretion of which depend upon external influences.

Notes on the overwintering of forest tree rusts, J. R. WEIR and E. E. HUBERT (*Phytopathology*, 8 (1918), No. 2, pp. 55-59).—Data are presented which indicate that *Melampsora bigelovii* on willows, *Melampsoropsis pyrolæ* on *Pyrolas*, *Pucciniastrum* sp. on *Epilobium adenocaulon*, *Melampsoridium betulæ* on birch, and *Pucciniastrum pyrolæ* on *Pyrolas* winter over by means of the uredinal stage. The *Pucciniastrum* sp. on *E. adenocaulon* is said to resemble very closely *P. epilobii* of Europe in its habit of wintering over.

The acidifying action of *Coniophora cerebella*, L. PETRI (*Ann. R. Ist. Sup. Forestale Naz. Firenze*, 2 (1916-17), pp. 433-447, figs. 2).—The study of *C. cerebella* in relation with pine, beech, and oak during eight months is said to have demonstrated an acidifying action of this fungus on these woods. The action is slight, being due to oxalic acid. Apparently superficial growth without alteration of the constituents of the cell walls does not lead to increase of acidity, but a continual oxidation, particularly of tannic acid in connection with enzym action, leads to a diminution of acidity. Either increase or decrease of acidity may appear in connection with the activity of *Merulius lacrymans*.

New hosts for *Razoumofskyia laricis*, J. R. WEIR (*Phytopathology*, 8 (1918), No. 2, pp. 62, 63).—This dwarf mistletoe, in addition to being abundant on *Larix*, is said to have been collected on *Pinus contorta*, *P. albicaulis*, *Picea engelmanni*, and *Abies lasiocarpa*. *R. douglasii* was common on *Pseudotsuga taxifolia* and was also collected on *Picea engelmanni* and *A. grandis*. *R. americana*, the common mistletoe of *Pinus contorta*, was also found on *P. ponderosa*.

Black canker of chestnut, L. PETRI (*Ann. R. Ist. Sup. Forestale Naz. Firenze*, 2 (1916-17), pp. 219-400, pls. 4, figs. 41).—An extended study has been made of the chestnut disease previously noted (E. S. R., 37, pp. 657, 658), and is herein reported on in considerable detail.

The specific infection producing ink disease, or black canker, of chestnut is localized in the cambium of the basal portions of the larger roots and the crown. It is normally a pluricellular parasitic fungus which may remain unicellular during a greater or lesser portion of its existence. Reproductive bodies have not yet been recognized. In the cambium it forms haustoria, which may be globose or filamentous.

Infection occurs usually by contact of sound with diseased material, and the disease is propagated rapidly, the death of the tree following the death of the cambium. The infection is soon complicated by the extension of other fungi into the region in question, and is easily confused therewith.

Among the predisposing conditions mentioned are impermeability of the soil and preponderance of clay. Apparently, *Polyporus sulphureus* is not even a predisposing factor. *Coryneum perniciosum* apparently meets very favorable conditions in the infected region, but this is only a sort of complementary factor, and the same is probably true of *Endothia radicalis*. The only remedies suggested are destruction of the diseased material and isolation of the area affected.

Study of the morphology and biology of *Blepharospora cambivora*, parasitic on chestnut, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), II. No. 11, pp. 297-299).—Further studies (see above) are claimed to have shown that black canker of chestnut is due primarily to a specific parasite (which has been designated *B. cambivora* n. sp.) attacking and destroying the cambium.

The parasite causing black canker of chestnut, L. PETRI (*Alpe [Italy]*, 2. ser., 5 (1918), No. 1-2, pp. 1-7).—Against the effects of black canker of chestnut, destruction of the trees is thought to be the chief if not the only remedy at present available.

Rhizoctonia as a needle fungus, C. HARTLEY (*Phytopathology*, 8 (1918), No. 2, p. 62).—The author reports observing Rhizoctonia on one-year-old Douglas fir seedlings in a forest nursery in Utah.

White pine blister rust [in Maine], C. L. WILKINS (*Agr. of Maine*, 1916, pp. 43-47).—White pine blister rust is said to have been shown by a brief survey, which is outlined, to exist in greater or less abundance in almost every pine-growing area in Maine. A brief account in popular form is given of the history, appearance, and treatment of this disease, which is declared to be a serious menace to the timber interests of Maine.

White pine blister rust, S. H. EATON (*Agr. of Maine*, 1916, pp. 78, 79).—Discussing the information noted above, the author emphasizes the danger from the spread of white-pine blister rust on pine and on its alternate host, currant or gooseberry.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Fresh water biology, H. B. WARD and G. C. WHIPPLE (*New York: John Wiley & Sons, Inc.*, 1918, pp. IX+1111, figs. 1547).—In the preparation of this work,

the first few chapters of which are devoted to a discussion of general biological factors, the authors were aided by a staff of specialists. Following an introduction by the senior author, the subject is dealt with as follows: Conditions of Existence, by V. E. Shelford (pp. 21-60); Methods of Collecting and Photographing, by J. Reighard (pp. 61-89); Bacteria, by E. O. Jordan (pp. 90-99); Blue-green Algæ (Cyanophyceæ), by E. W. Olive (pp. 100-114); The Fresh-water Algæ, Excluding the Blue-green Algæ, by Julia W. Snow (pp. 115-177); The Larger Aquatic Vegetation, by R. H. Pond (pp. 178-209); Amoeboid Protozoa (Sarcodina), by C. H. Edmondson (pp. 210-237); Flagellate and Ciliate Protozoa (Mastigophora and Infusoria), by H. W. Conn and C. H. Edmondson (pp. 238-300); The Sponges (Porifera), by E. Potts (pp. 301-315); Hydra and Other Fresh-water Hydrozoa, by F. Smith (pp. 316-322); The Free-living Flatworms (Turbellaria), by Caroline E. Stringer (pp. 323-364); Parasitic Flatworms, by H. B. Ward (pp. 365-453); The Nemertean, by W. R. Coe (pp. 454-458); Free-living Nematodes, by N. A. Cobb (pp. 459-505); Parasitic Roundworms, by H. B. Ward (pp. 506-552); The Wheel Animalcules (Rotatoria), by H. S. Jennings (pp. 553-620); Gastrotricha, by H. B. Ward (pp. 621-631); Aquatic Earthworms and Other Bristle-bearing Worms (Chaetopoda), by F. Smith (pp. 632-645); The Leeches (Hirudinea), by J. P. Moore (pp. 646-660); The Fairy Shrimps (Phyllopoda), by A. S. Pearse (pp. 661-675); The Water Fleas (Cladocera), by E. A. Birge (pp. 676-740); Copepoda, by C. D. Marsh (pp. 741-789); The Ostracoda, by R. W. Sharpe (pp. 790-827); High Crustaceans (Malacostraca), by A. E. Ortmann (pp. 828-850); The Water Mites (Hydracarina), by R. H. Wolcott (pp. 851-875); Aquatic Insects, by J. G. Needham (pp. 876-946); Moss Animalcules (Bryozoa), by C. B. Davenport (pp. 947-956); The Mollusca, by B. Walker (pp. 957-1020); The Aquatic Vertebrates, by C. H. Eigenmann (pp. 1021-1066); and Technical and Sanitary Problems, by G. C. Whipple (pp. 1067-1083).

Exterminating predatory animals, E. W. NELSON (*Nat. Wool Grower*, 8 (1918), No. 3, pp. 14-16).

Rodents of Colorado in their economic relation, W. L. BURNETT (*Off. State Ent. Colo. Circ.* 25 (1918), pp. 31, figs. 15).—The author here presents an economic treatment of each genus and many of the species of mammals known to occur in the State, together with a list of the others.

A bibliography of British ornithology from the earliest times to the end of 1912, W. H. MULLENS and H. K. SWANN (*London: Macmillan & Co., Ltd.*, 1916, pts. 2, pp. 113-240; 3, pp. 241-384; 4, pp. 385-496; 1917, pts. 5, pp. 497-624; 6, pp. 625-691+XX).—These parts complete the work, part 1 of which has been previously noted (E. S. R., 36, p. 251).

List of generic terms proposed for birds during the years 1890 to 1900, inclusive, to which are added names omitted by Waterhouse in his *Index Generum Avium*, C. W. RICHMOND (*Proc. U. S. Nat. Mus.*, 24 (1903), pp. 663-729).—This list supplements Waterhouse's *Index Generum Avium*.¹

Generic names applied to birds during the years 1901 to 1905, inclusive, with further additions to Waterhouse's *Index Generum Avium*, C. W. RICHMOND (*Proc. U. S. Nat. Mus.*, 35 (1909), pp. 583-655).—A second supplementary list.

Generic names applied to birds during the years 1906 to 1915, inclusive, with additions and corrections to Waterhouse's *Index Generum Avium*, C. W. RICHMOND (*Proc. U. S. Nat. Mus.*, 53 (1917), pp. 565-636).—A third supplementary list.

New light on the status of *Empidonax traillii*, H. C. OBERHOLSER (*Ohio Jour. Sci.*, 18 (1918), No. 3, pp. 85-98).—The author recognizes a new sub-

¹ *Index Generum Avium*, by F. H. Waterhouse (London: R. H. Porter, 1889, pp. 240).

species, *E. traillii breusteri*, 209 specimens of which flycatcher were examined from various localities in the United States and Central America.

The woodpeckers of Colorado, F. C. LINCOLN (*Colo. Mountain Club Pub. 6* (1917), pp. 22, figs. 13).—Nine species are described as occurring within the State.

The Acanthocephala of North American birds, H. J. VAN CLEAVE (*Trans. Amer. Micros. Soc., 37* (1918), No. 1, pp. 19–47, figs. 34).—This reports the results of a study of the Acanthocephala parasitic in birds from the United States Government and private collections. It is pointed out that the occurrence of two different species of Acanthocephala within the same host individual has never been recorded, and that there is no positive case on record of the occurrence of two different genera of Acanthocephala within the same species of North American birds. Tables are given showing the comparison of acanthocephalan infestation in the families and orders of birds of central Europe and of North America, together with a key to all described species of Acanthocephala from North American birds.

A list of 15 titles to the literature cited is included.

On the trematodes of Australian birds, S. J. JOHNSTON (*Jour. and Proc. Roy. Soc. N. S. Wales, 50* (1916), pt. 2, pp. 187–261, pls. 11, figs. 10).—Included in this paper are descriptions of one new genus and 21 new species, a list of the trematode parasites arranged according to the classification of the birds together with the nearest relative of the trematode and its host, so that the relationships of the hosts may be readily seen, and a bibliography of 48 titles.

Larval trematodes from Kansas fresh-water snails, E. C. O'ROKE (*Kans. Univ. Sci. Bul., 10* (1917), No. 7, pp. 161–180, pls. 7).—This report of studies of larval trematodes from fresh-water snails includes descriptions of new forms.

A census of the endoparasites recorded as occurring in Queensland, arranged under their hosts, T. H. JOHNSTON (*Proc. Roy. Soc. Queensland, 28* (1916), pp. 51–79).—This is a list of internal parasites recorded definitely from Queensland. A 12-page list of the literature referring to the presence of entozoa in Queensland is included.

[Report of the] entomological branch, M. BURRELL (*Rpt. Min. Agr. Canada, 1917, pp. 78–82*).—A brief summary of the work of the year.

[Insects and their control in Antigua], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Antigua, 1916–17, pp. 16, 17*).—A brief account is given of the occurrence of the more important insect enemies of sugar cane, cotton, limes, sweet potatoes, Indian corn, and onions, and means for their control.

[Lists of economic insects in France], P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1917, Nos. 2, pp. 6, 7, 8, 9, 11, 12, 13–15; 3, pp. 6–16; 4, pp. 10, 11*).—Annotated lists are given of insects attacking special crops in France, including variegated reed grass (*Phalaris*), Phleum, foxtail (*Alopecurus*), sainfoin (*Hedysarum*), vetch (*Vicia*), dyer's broom (*Sarothamnus*), and oat grass (*Avena elatior*).

Annual report of the government entomologist, C. C. GOWDEY (*Ann. Rpt. Dept. Agr. Uganda, 1917, pp. 32–37*).—The more important pests of the year are reported upon under the headings of those attacking coffee, cacao, tea, cotton, rubber, fruit trees, the shade tree *Gliricidia maculata*, etc. A list of beneficial parasites and predators reared during the year, together with their hosts, is included.

Division of entomology, annual report, 1915–16, C. P. LOUNSBURY (*Union So. Africa Dept. Agr. Rpt., 1916, pp. 83–103*).—This is a detailed report of the entomological work of the year, in which particular consideration is given to the occurrence of and work with locusts.

Administration report of the government entomologist for 1916-17, T. V. RAMAKRISHNA AYYAR (*Rpt. Dept. Agr. Madras, 1916-17, pp. 61-64*).—A brief statement of the work of the year with insect pests in Madras.

A catalogue of the Lepidoptera, edited by H. WAGNER (*Lepidopterorum Catalogus. Berlin: W. Junk, 1912, pt. 10, pp. 86; 1913, pls. 11, pp. 65; 12, pp. 77; 13, pp. 53; 14, pp. 192; 15, pp. 28; 16, pp. 35; 17, pp. 44; 1914, pls. 18, pp. 79-220; 19, pp. 64; 20, pp. 55*).—In continuation of the parts previously noted (E. S. R., 28, p. 252), part 10, by E. Meyrick, catalogues the Tortricidae; part 11, by Eltringham and Jordan, the subfamily Acraeinae of the Nymphalidae; part 12, the subfamily Acherontiinae, and part 18, the subfamilies Ambulicini and Sesini of the Sphingidae, by H. Wagner; part 13, by E. Meyrick, the families Carposinidae, Heliodontidae, and Glyphipterygidae; part 14, by L. B. Prout, the subfamily Hemitheinae of the Geometridae; part 15, by K. W. von Dalla Torre, the subfamilies Castniinae, Neocastniinae, and Pemphigostolinae of the Castniidae; part 16 the Brahmaeidae, by E. Strand, and the Megalopygidae, Dalceridae, and Epipyropidae, by H. G. Dyar and E. Strand; parts 17 and 19, by E. Meyrick, the Pterophoridae and Orneodidae; and the Hyponomeutidae, Plutellidae, and Amphitheridae, respectively; and part 20, by K. W. von Dalla Torre, the Thyrididae.

Report of the assistant professor of entomology, MADAN MOHAN LAL (*Rpt. Dept. Agr. Punjab, 1917, pp. IX, X*).—A brief report upon the occurrence of and control work with the more important insect pests of the year, including a note on sericulture.

[Report of the] division of entomology, F. P. JEPSON (*Fiji Dept. Agr. Ann. Rpt. 1916, pp. 16-25*).—The more important insects injurious to cultivated crops, including bananas, coconuts, cacao, etc.; to fruit trees and vegetables, including oranges and mandarines, etc.; to ornamental plants; and to man and animals, etc., during 1916 are considered.

Entomological notes, W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 28 (1917), No. 12, pp. 891-895, figs. 3*).—Notes are presented on the yellow-barred grass moth (*Eutane terminalis*), a stag-horn fern pest (*Halticorcus platyceri*), and a remarkable click beetle (*Tetralobius fortnumi*).

Important clover insects, H. A. GOSSARD (*Mo. Bul. Ohio Sta., 3 (1918), No. 6, pp. 190-193, figs. 2*).—In continuation of this series of popular articles on clover insects (E. S. R., 39, p. 264), the clover seed chalcid fly and clover seed caterpillar (*Enarmonia interstinctana*) are considered.

Insects of a citrus grove, J. R. WATSON (*Florida Sta. Bul. 148 (1918), pp. 169-267, figs. 68*).—Brief accounts are given of the more important injurious insects of citrus in Florida and means for their control. A list of publications relating to citrus insects in Florida is included, together with an index to the subject matter.

Insects injurious to the pecan, J. MARZ (*Florida Sta. Bul. 147 (1918), pp. 150-162, figs. 14*).—Brief accounts are given of the more important insect enemies of the pecan in Florida with control measures therefor. The pests considered are the pecan leaf case bearer (*Acrobasis nebulella*), pecan nut case bearer (*A. hebescella*), pecan shuckworm (*[Enarmonia] Laspeyresia caryana*), pecan cigar case bearer (*Coleophora caryæfoliella*), fall webworm, walnut caterpillar (*Datana integerrima*), pecan bud moth (*Proteopteryx bolliana*), flat-headed apple-tree borer, hickory twig girdler (*Oncideres cingulatus*), red-shouldered shot-hole borer (*[Sinoxylon] Xylotiopsis basilaris*), oak or hickory cossid (*Cosula magnifica*), and hickory phylloxera (*Phylloxera caryæcaulis*).

Insect pests of basket willows, J. C. F. FRYER (*Jour. Bd. Agr. [London], 24 (1917), No. 8, pp. 844-852, pls. 4*).—A summary of information on the more important insect enemies of the basket willows.

Insects and the national health, C. T. BRUES (*Sci. Mo.*, 6 (1918), No. 3, pp. 193-209, figs. 14).—The importance of insects in the dissemination of disease is emphasized.

Progress report of special committee on the damage to stored grain by insects, L. ROSSELL, W. W. FROGGATT, and W. A. HASWELL (*Advisory Council Sci. and Indus., Aust., Bul.* 5 (1917), pp. 20-23).—This report includes a discussion of the development of weevils in wheat and the increase in number of weevils, destruction of weevils by means of poisonous gases and by drying, favorable and unfavorable conditions, etc.

Fumigation with chlorpicrin, W. MOORE (*Jour. Econ. Ent.*, 11 (1918), No. 4, pp. 357-362).—The author's experiments at the Minnesota Experiment Station, here reported, are summarized as follows:

"Chlorpicrin used at the rate of from 0.5 to 1 lb. to 1,000 cu. ft. will destroy insects which require from 3 to 8 lbs. of carbon bisulphid. There is more likelihood of injury to germination than in the use of carbon bisulphid, but with normal doses, if the grain is dry and is thoroughly aired after fumigation, no injury results. Chlorpicrin is able to penetrate through 50-lb. sacks of flour in 24 hours at a temperature of 70° F., killing all the insects. Chlorpicrin has a slight injurious influence on the baking qualities of flour. Chlorpicrin free from impurities of chlorin and nitrogen peroxid will injure neither dress materials nor their color." Its value as a fumigant to destroy the clothes louse (*Pediculus humanus [vestimentii]*) and its eggs has been reported (*E. S. R.*, 38, p. 765).

The biology of dragonflies (Odonata or Paraneuroptera), R. J. TILLYARD (*Cambridge, Eng.: University Press*, 1917, pp. XII+396, pls. 4, figs. 188; *rev. in Jour. Roy. Micros. Soc.*, No. 1 (1918), pp. 55, 56).—This work presents a full and complete account of the biology of the Odonata so far as the present status of knowledge permits.

Grasshoppers, T. L. GUXTON (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 7, pp. 204-207).—A popular summary of information on grasshoppers and their control.

Experiments on the physiology of digestion in the Blattidae, E. W. SANFORD (*Jour. Expt. Zool.*, 25 (1918), No. 2, pp. 355-411, figs. 21).—An abstract of this article has been previously noted (*E. S. R.*, 38, p. 558).

On a collection of Thysanoptera from St. Vincent, with descriptions of four new species, R. S. BAGNALL (*Jour. Zool. Research*, 2 (1917), No. 1, pp. 21-27, figs. 3).—Notes are presented on eight species, of which four are described as new.

The southern green plant bug, T. H. JONES (*U. S. Dept. Agr. Bul.* 689 (1918), pp. 27, figs. 14).—This is a report of studies, conducted principally at Baton Rouge, La., of *Nezara viridula*, a serious pest of cultivated plants in the southern portion of the United States, particularly in the Gulf States.

The species is recorded from the whole of Europe except the extreme north, Asia, Africa, Malaysia, Australia, New Zealand, South America, at least in the north, Central America, and enters into the United States at the South. Young growing shoots and developing fruits are most seriously injured. It has been recorded as feeding on beans, cotton, cowpea, *Gynandropsis pentaphylla*, hackberry, okra, maize, mulberry, orange, peas, pepper, potato, rice, sugar cane, sunflower, sweet potato, tomato, and turnip. The author has taken it on a number of these plants and, in addition, on Brussels sprouts, cauliflower, collards, eggplant, globe artichoke, mustard, and radish.

The number of eggs deposited by different females varied greatly, ranging from 0 to 240. A female which had laid 240 eggs was found to have 77 well-developed eggs in its ovaries at time of death. The eggs are placed on the

underside of the leaves in clusters of from 36 to 116 eggs. "In the insectary the minimum period necessary for the incubation of the eggs was 5 days. For the five nymphal stages the minimum periods were 3, 4, 5, 6, and 7 days, respectively, a total of 30 days for the egg and nymphal stages. . . .

"Eggs have been found in the field at Baton Rouge as early as April 13 and as late as November 8. It is probable that in this latitude four generations may develop in a year. Adults are found hibernating during the winter months, but they also occur on plants in the field during mild periods of weather during this season.

"Four enemies have been observed, the tachinid fly *Trichopoda pennipes* apparently being the most important.

"As a method of control the collection and destruction of eggs, nymphs, and adults is recommended where valuable vegetable crops are attacked. Adults congregate on turnip and mustard during the fall and a few of these plants, or others on which they congregate, might be grown as trap crops in sections where serious injury by the species occurs. The adults may be collected from these plants and destroyed."

An annotated bibliography of 14 titles is included.

A new corn insect from California, C. J. DRAKE (*Jour. Econ. Ent.*, 11 (1918), No. 4, p. 335).—A new lace bug taken from corn in the Grass Valley, Cal., is here described as *Corythucha essigi*.

[The West Indian cotton stainer (*Dysdercus delauneyi*)] (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1916-17, pp. 11-15*).—A brief account of the life history and control of this cotton stainer, a more detailed account of which has been previously noted (*E. S. R.*, 38, p. 461).

Contribution to the knowledge of Toxoptera graminum in the South, P. LUGNBILL and A. H. BEYER (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 2, pp. 97-110, pl. 1, figs. 8).—This is a report of life history studies made at a field station of the Bureau of Entomology of the U. S. Department of Agriculture at Columbia, S. C., with a view to supplementing those conducted primarily in the North and reported upon by Webster and Phillips (*E. S. R.*, 27, p. 859). This study was begun in the spring of 1913, continued through the year 1914 and to the spring of 1915.

The investigation shows that oviparous forms develop in the latitude of Columbia, S. C. Whether or not the strain becomes weaker as it grows older requires further experimentation, although the experiments would indicate that to be the case.

Crithidia euryophthalmi n. sp., from the hemipteran bug, Euryophthalmus convivus, IRENE McCULLOCH (*Univ. Cal. Pubs. Zool.*, 18 (1917) No. 5, pp. 75-88, figs. 35).—The digestive tract of 80 per cent of the bugs (*E. convivus*) that feed upon one of the common lupines (*Lupinus arboreus*) in the vicinity of San Francisco is said to be heavily infested by a flagellate (*C. euryophthalmi* n. sp.), the life cycle of which is here considered.

African Aphididae, I-III, F. V. THEOBALD (*Bul. Ent. Research*, 4 (1914), No. 4, pp. 313-337, figs. 17; 6 (1915), No. 2, pp. 103-153, figs. 33; 8 (1918), No. 3-4 pp. 273-294, figs. 15).—These papers include descriptions of 9 species, 3 genera and 19 species, and 12 species, respectively, new to science.

Wild cochineal insects as prickly-pear destroyers, J. WHITE-HANEY (*Ann. Rpt. Dept. Pub. Lands Queensland, 1915, pp. 92-94, pl. 1*).—In addition to a brief account of the destruction of *Opuntia monacantha* by *Coccus indicus*, a discussion of which has been previously noted (*E. S. R.*, 35, p. 55), mention is made of its destruction also by *C. confusus capensis* from South Africa and of the possibility of wild cochineal insects attacking useful plants.

The pine scale (*Leucaspis pini*) in Argentina, J. BRÈTHES (*An. Soc. Rural Argentina*, 51 (1917), No. 5, p. 384, fig. 1).—The occurrence of this European scale in Argentina is reported for the second time, having first been recognized in 1906 from Mendoza. The present record is from the south of the Province of Buenos Aires.

A list of Uganda Coccidæ, their food plants and natural enemies, C. C. GOWDEY (*Bul. Ent. Research*, 8 (1917), No. 2, pp. 187-189).—Seventy-two species are recorded.

The status of introduced coccids in South Africa in 1917, C. K. BRAIN and A. E. KELLY (*Bul. Ent. Research*, 8 (1917), No. 2, pp. 181-185).—An annotated list of 55 species.

Instructions for collecting and preserving valuable Lepidoptera, J. SINCLAIR (*Los Angeles, Cal.: Author*, 1917, pp. 80, figs. 72).—Instructions for collecting and preserving Lepidoptera are presented in popular form.

Sericulture in tropical countries, A. FAUCHÈRE (*La Sériciculture en Pays Tropical. Paris: Augustin Challamel*, 1917, pp. 119, figs. 26).—This is a report upon the acclimatization of the mulberry silkworm and of the mulberry in Madagascar. The several chapters deal with the culture of the mulberry, rearing of the silkworm, diseases and enemies of the silkworm, production of silkworm eggs, summary of a study of the cocoons and of raw silk products in Madagascar, and the importance and future of sericulture in the interior of Madagascar.

Female Lepidoptera at light traps, W. B. TURNER (*Jour. Agr. Research* [U. S.], 14 (1918), No. 3, pp. 135-149).—This report is based upon extended observations made during the summer of 1916 at a field station of the Bureau of Entomology of the U. S. Department of Agriculture at Hagerstown, Md., with a view to securing some definite information as to the relative proportions of the sexes of moths attracted to light and the percentage of gravid females among those so taken. The results are reported in detail in tabular form. The material collected and examined included over 11,000 individuals, representing 3 families and about 20 species.

"Of the 11,222 moths examined 8,025, or 71.5 per cent were males; 3,197, or 28.5 per cent were females. In only one species, *Noctua c-nigrum*, did the females taken equal or exceed the males." Of 3,197 individuals dissected, 1,857, or 58 per cent, were gravid. These gravid females made up 16.6 per cent of the 11,222 moths examined. All the females of 4 of the 6 species of Arctiidae under observation were gravid, and in the two other species the gravid females represent 85.5 per cent and 96 per cent of the females collected.

Brief abstracts of the literature on the subject, together with a bibliography of 16 titles are included.

Partial disinfection of mulberry leaves in feeding silkworms, ROSA SACCHI (*Staz. Sper. Agr. Ital.*, 50 (1917), No. 2, pp. 49-68; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 1027, 1028).—The author reports upon experiments made to determine the value of partial disinfection in protecting the worms from attacks of flacherie and in increasing the vigor of vegetative growth. The following conclusions are drawn from the results obtained:

"If the silkworms are fed on leaves washed with water or an aqueous solution of lysoform or 'tachiol' far fewer leaves are consumed than if they had not been subjected to the treatment described. Although silkworms fed on moist leaves eat less they weigh more than those fed on dry leaves. The treatments described did not prevent the occurrence of a few sporadic cases of flacherie and emaciation.

"The silk cover of cocoons from silkworms fed on partially sterilized leaves is heavier than that from silkworms fed on ordinary leaves. This increase in

weight also occurs when the silkworms are fed on leaves sufficiently well washed with fresh or boiled spring water. The feeding of silkworms with washed leaves has a favorable influence on the quality of the silk, particularly on the length, tenacity, and elasticity, as well as the weight of the reeled silk."

Notes on the poisonous urticating spines of *Hemileuca olivæ* larvæ, D. J. CAFFEY (*Jour. Econ. Ent.*, 11 (1918), No. 4, pp. 363-367).—The author reports studies made of the spines of the New Mexican range caterpillar, showing them to be a source of danger and discomfort to people coming in contact with the species.

"The effect of the poisonous agent in these spines appears to be accumulative in its nature rather than to confer any degree of immunity through continual contact. The injury may be internal or external. The external injury varies in severity according to the part of the body affected and may lead to partial disability for short periods. The internal injury is more severe than the external injury, and in advanced cases may result in typical asthmatic symptoms or other disorders of the respiratory tract. The urticating spines from the molted skins of the larvæ become scattered through the range grasses and render small areas unfit for grazing."

The false tussock caterpillars on shade trees, J. M. SWAINE (*Agr. Gaz. Canada*, 4 (1917), No. 12, pp. 1043-1047, figs. 6).—A brief account is given of the hickory tussock moth (*Halisidota caryæ*), the spotted tussock moth (*H. maculata*), and the pale tussock or checkered tussock moth (*H. tessellaris*). These are the most abundant and widely distributed of the defoliating caterpillars, of which there was a rather severe outbreak in eastern Canada during the summer of 1917. The common ichneumon *Scambus pedalis* is the most abundant parasite reared from *Halisidota* cocoons. *Theronia melanocephala* and *Amblyteles malacus* are said to have been reared from *Halisidota* caterpillars.

Descriptions of new Lepidoptera from Mexico, H. G. DYAR (*Proc. U. S. Nat. Mus.*, 54 (1918), pp. 335-372).—The present paper includes descriptions of 117 new species and 12 new genera, a synoptic table, and a reference to synonymy.

The small cabbage moth (*Plutella maculipennis*), D. GUNN (*Union So. Africa, Dept. Agr. Bul.* 8 (1917), pp. 10, figs. 8).—A brief summary of information on the diamond-back moth (*P. maculipennis*), a widespread enemy of crucifers in South Africa, and means for its control.

The white-marked tussock moth and its control on shade trees and orchard trees, J. M. SWAINE and G. E. SANDERS (*Canada Dept. Agr., Ent. Branch Circ.* 11 (1918), pp. 12, figs. 9).—A popular article prepared to furnish information on the control of the white-marked tussock moth, a widespread pest throughout eastern Canada which periodically causes serious damage to shade trees and to fruit.

Notes on the migration of the Hessian fly larvæ, J. W. MCCOLLOCH and H. YUASA (*Jour. Anim. Behavior*, 7 (1917), No. 5, pp. 307-323, figs. 5).—This is a report on Hessian fly investigations, conducted at the Kansas Experiment Station, which are summarized by the authors as follows:

"The direction of the migration of the larva in its initial stage is predetermined by the orientation of the eggs. The larvæ on hatching always turn from the anterior toward the posterior end of the eggs. The degree of inclination of the leaf has nothing to do with the direction of the larval migration. The larvæ are capable of locomotion on either an ascending or descending incline of anywhere between zero and 90°. When the eggs are laid with their anterior ends toward the base of the leaf, the larvæ, on hatching crawl up the leaf until they reach the tip, then turn and move downward. The larvæ may die while on this ascending migration, but apparently never try to change the direction of progress.

"The rate of migration is extremely variable and seems to be influenced by individual differences rather than physical factors. The average time required by 205 larvæ hatching from eggs laid normally to move 1 mm. was about 4.5 minutes, with extremes of 0.5 minute and 75 minutes. The average time required by 119 larvæ hatching from eggs deposited in an inverted position to move 1 mm. was about 3.5 minutes, with extremes of 0.4 of a minute and 46 minutes.

"The mortality of migrating larvæ is greatest when the eggs are laid in an inverted position. Twenty-three per cent of the larvæ hatching from eggs laid normally died on migration, while 57 per cent of the larvæ hatching from eggs deposited in an inverted position perished. When the eggs are deposited normally, the percentage of mortality increases with the distance of the egg from the ligule. When the eggs are laid in an inverted position, the mortality increases with the distance of the egg from the tip of the leaf."

A simple method of identifying the *Anopheles* mosquitoes of the Canal Zone, L. H. DUNN (*Proc. Med. Assoc. Isthmian Canal Zone*, 9 (1916), pt. 2, pp. 64-68).—The author presents a simplified table for the identification of 11 species occurring in the Canal Zone, of which 7 are quite commonly met with.

Control of house flies by the maggot trap method, E. N. CORRY (*Maryland Sta. Bul.* 213 (1918), pp. 103-126, figs. 12).—This bulletin reports upon the results of 3 years' studies conducted at the station in cooperation with the Bureau of Entomology of the U. S. Department of Agriculture, the work of the first year (1914) having been previously reported upon by Hutchison (*E. S. R.*, 33, p. 156).

The average percentage of maggot destruction during the 3 years was 95.8 per cent. The reduction in fly prevalence amounted to 76 per cent in 1914, but was not so marked in the 2 years following, due apparently to the presence of additional fly breeding sources and the difficulty of obtaining accurate results. Modifications of the traps as a result of experience have evolved a trap that is practical for the farm producing large quantities of manure daily.

It is pointed out that close packing of manure, watering the pile, and the return of leached materials to the manure tend to conserve the fertilizing value of the manure. "The labor involved is only slightly greater than that required to dump the manure in a pile. The difference is in the time required to water the pile daily and to clean the basin once every two or four weeks, depending upon whether one or two traps are constructed. The saving in fertilizer and the destruction of a large percentage of the flies, particularly on isolated farms, will more than repay the cost of construction and operation."

The life history and habits of *Chloropisca glabra*, a predacious oscinid, J. R. PARKER (*Jour. Econ. Ent.*, 11 (1918), No. 4, pp. 363-380, fig. 1).—The author's studies at the Montana Station show that the larvæ of this oscinid are predacious upon the sugar beet root louse, it being the first species of the group known to possess predacious habits.

The eggs are deposited about the base of the sugar beet plants and of *Chenopodium album*. Dissections of 30 females showed the presence of from 32 to 64 eggs, with an average of 52. The incubation period in August is from 3 to 5 days.

Though never detected attacking or feeding upon root lice in the field, when confined with them in small tin boxes the maggots feed quite readily. The point of attack is generally on the side of the first segment of the abdomen and more rarely on the ventral surface. The maggot's head is inserted well into the aphid and the soft body contents are sucked out.

The larval period in the field appears to vary from 10 to 20 days. The pupal period generally extends from some time in August or September until the

following May, or a period of about 9 months, but a few individuals may emerge during the same season in which the puparia are formed, remaining in the pupal stage only 2 or 3 weeks. The winter is passed as a puparium in the soil where the larva completed feeding.

"Three maggots were able to complete their growth and pupate on a food supply of only 21 large aphids per maggot, while another maggot after it was apparently full grown consumed 52 aphids. It is probable that maggots under natural conditions in root louse colonies where food is always within their reach would each consume as many as 75 aphids."

The studies show this dipteran to be by far the most effective insect enemy of the sugar beet root louse, the worst pest with which the sugar beet growers of Montana have to contend. "Hundreds of puparia have frequently been found in the soil around a single sugar beet, which means that large numbers of root lice have been destroyed. The larva is particularly efficient in that it concentrates its efforts on destroying only well-developed root lice, thus preventing the birth of young root lice that would soon increase to enormous numbers. It is not uncommon to find a large number of puparia in the soil around a sugar beet plant with only the empty skins and secretions of the root lice to indicate their former abundance.

"It is certain that *C. glabra* larvæ act as a very important check upon the increase of sugar beet root lice and in many instances destroy entire colonies."

Second paper on Brazilian Muscoidea collected by Herbert H. Smith, C. H. T. TOWNSEND (*Bul. Amer. Mus. Nat. Hist.*, 37 (1917), pp. 221-233).

Effect of humidity on pupal duration and on pupal mortality of *Drosophila ampelophila*, A. ELWYN (*Bul. Amer. Mus. Nat. Hist.*, 37 (1917), pp. 347-353, fig. 1).—The data presented are summarized by the author as follows:

"Changes in relative humidity have no marked effect on the length of pupal period of *D. ampelophila*. Changes in relative humidity produce striking changes in the mortality of *Drosophila*, the mortality increasing with a decrease of humidity [and] the optimum humidity being 100 per cent. The effects of low humidity on mortality are most marked with very young pupæ, whose covering permits a rapid evaporation of body moisture. After a few hours, when integumental changes making evaporation more difficult have set in, the effects of low humidity are correspondingly decreased."

A dipterous parasite of terrestrial isopods (*Phyto melanocephala*), W. R. THOMPSON (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 16, pp. 785-788, figs. 7; *abs. in Rev. Appl. Ent.*, Ser. A, 6 (1918), No. 1, p. 35).—The tachinid *P. melanocephala* was found to be a fairly common parasite of *Porcellio scaber* and *Oniscus asellus* in the neighborhood of Portsmouth, England.

Some practical methods adopted for the control of flies in the Egyptian campaign, J. DAVIDSON (*Bul. Ent. Research*, 8 (1918), No. 3-4, pp. 297-309, figs. 7).—The author outlines the methods followed in dealing with the fly problem while commanding a sanitary section of the Egyptian Expeditionary Force during the year 1916-17.

The control of the clover flower midge, C. W. CREEL and L. P. ROCKWOOD (*U. S. Dept. Agr., Farmers' Bul.* 971 (1918), pp. 12, figs. 6).—A popular account of *Dasyneura leguminicola*. Control measures include light or close pasturing, early or late cutting, clipping, and soiling.

Controlling the clover flower midge in the Pacific Northwest, C. W. CREEL and L. P. ROCKWOOD (*U. S. Dept. Agr., Farmers' Bul.* 942 (1918), pp. 12, figs. 6).—A discussion of control measures for this pest in the Northwest, which are, with certain modifications, the same as those followed in the East as described in the publication noted above.

Observations on certain flies infecting meat or causing human myiasis, G. DEXLER (*Ztschr. Fleisch u. Milchhyg.*, 27 (1916), Nos. 3, pp. 35-38; 4, pp. 52-54; 5, pp. 68-71; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 968, 969).—This is a report of observations of live adults, eggs, larvæ, pupæ, etc., of flies found to visit meat in two of the largest meat markets in Vienna.

"The species most frequently occurring on meat are *Lucilia sericata*, *Calliphora erythrocephala*, *Sarcophaga hæmorrhoidalis*, *S. murus*, *S. falculata*, *Phormia groenlandica*, *Muscina stabulans*, *Fannia canicularis*, and *F. scalaris*. The following rarely occur on meat: *Ophyra leucostoma* and *Drosophila funebris*; they feed on it, but never oviposit. The same thing holds for *Musca domestica*, *C. vomitoria*, *S. carnaria*, *Musca meridiana*, and *Stomoxys calcitrans*. The presence of the larvæ of these flies affords no evidence as to whether the meat is putrid or not.

"The dimensions of the larvæ can only be determined with precision after they have been killed; the size is practically of no use for determining the length of infection. If the infected meat is exposed to a temperature of 10° C. [50° F.] the process of hatching is arrested and the eggs gradually die off. The larvæ die if exposed to direct sunlight or if the medium in which they occur becomes dry. A temperature of below 7° arrests the development of the larvæ but does not kill them. The optimum growth temperature is between 20 and 40°. The larva pupates on the fifth or sixth day after hatching, both at the above temperatures or at a temperature of 15 to 17°. Meat containing larvæ can be dangerous to man if eaten raw.

"No effective method is yet known for protecting meat from becoming infested with flies. At present the best way is to keep the meat in a cool, dark place. The larvæ are not killed either by washing the meat with vinegar or a solution of potassium permanganate, or even by immersing the meat in these two liquids."

Supplement to preliminary list of the Coleoptera of the West Indies, C. W. LENG and A. J. MUTCHLER (*Bul. Amer. Mus. Nat. Hist.*, 37 (1917), pp. 191-220).—The additions, corrections, and notes included in this paper supplement the list previously noted (*E. S. R.*, 34, p. 556).

The elm-leaf beetle (*Galerucella luteola*) in Spain in 1917, J. DANTÍN CERECEDA (*Liga Agraria*, 30 (1917), No. 1139, p. 2; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 10, p. 1446).—An account of the biology of and control measures for the elm-leaf beetle in Spain, in which country its greatest injury was caused in 1917.

Carabidæ injurious to the strawberry, P. LESNE (*Jour. Agr. Prat.*, n. ser., 30 (1917), No. 26, pp. 504, 505, figs. 2).—Brief reference is made to several carabids which are a source of injury to the strawberry. See also a previous note (*E. S. R.*, 38, p. 654).

It is pointed out that there is in the family Carabidæ a series of species in which the food is normally phytophagous (*Zabrus*, *Ditomus*, etc.) or mixed (certain *Amara*, etc.), and another series comprising carnivorous species which show a liking for the sweet pulp of fruits (*Carabus*, *Calathus*, etc.). The European species which have been a source of injury to ripe fruit are *Pterostichus melanarius*, *Steropus madidus*, *Calathus fuscipes*, *Ophonus ruficornis*, and *Harpalus distinguendus*.

The cane grubs of Australia, II, A. P. DODD (*Bur. Sugar Expt. Stas. Queensland, Div. Ent. Bul.* 6 (1917), pp. 30).—This report is in continuation of investigations previously noted (*E. S. R.*, 35, p. 57).

The habits and control of white grubs in Manitoba, N. CRIDDLE (*Agr. Gaz. Canada*, 5 (1918), No. 5, pp. 449-454, figs. 4).—This article deals with the four species of white grubs known to occur at the present time within the Province of Manitoba, namely, *Lachnosterna anxia*, *L. nitida*, *L. drakii*, and *L. rugosa*.

A possible factor in coconut-beetle control, P. J. WESTER (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 3, pp. 299, 300).—Mention is made of a flying lemur (*Galeopithecus* sp.), commonly known as caguan, occurring in the interior of the island of Bohol, which has been domesticated by the Filipinos and reared partly for its skin and partly for catching coconut beetles. It is thought that this mammal may prove to be of sufficient value in combating the coconut beetle to warrant rearing it.

The maize beetle (*Heteronychus mashunus*), R. W. JACK (*Rhodesia Agr. Jour.*, 15 (1918), No. 1, pp. 10-16, pls. 2).—An account of the life history and habits and control measures of this beetle, which has been the cause of heavy loss to corn growers in various parts of Rhodesia.

The beetles attack the seed as it germinates and the plants at almost any stage during growth, the young shoot from the seed frequently being destroyed so that the plant does not appear above ground. The stalks of the larger plants are eaten into an inch or two beneath the surface of the soil, resulting in the withering of the center of the plant.

Notes on *Eleodes tricolorata*, H. B. PARKS (*Jour. Econ. Ent.*, 11 (1918), No. 4, p. 388).—Referring to the paper by McColloch previously noted (*E. S. R.*, 39, p. 363), the author states that this pest has been reported in destructive numbers during the season of 1918 with few exceptions from every county in Texas from Wilbarger on the north to Jim Wells on the south, and from Callahan east to the State line. The work of the larva somewhat resembles that of the true cutworms, but it will also climb large plants and cut off buds and leafstalks. It works very heavily on radishes, cabbage, onions, tomatoes, potatoes, corn, cane, and almost everything else in garden or field. Most gardeners were satisfied with the results obtained from the use of poisoned bran mash, Paris green giving better results than arsenate of lead.

Clover root borer, J. R. STEAR (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 6, pp. 187-189, figs. 2).—A popular article on *Hylastinus obscurus*.

A new scolytid injurious to dried sweet potatoes in Jamaica, W. SAMPSON (*Bul. Ent. Research*, 8 (1918), No. 3-4, p. 295).—A beetle which causes serious damage to dried sweet potato chips in Jamaica is described as *Hypothemus ritchiei* n. sp.

The cigarette beetle, D. B. MACKIE (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 3, pp. 225-241, figs. 5).—This discussion includes an account of the life history of the cigarette beetle and directions for the fumigation of tobacco by the vacuum method.

A new weevil pest of sweet potatoes in Jamaica, G. A. K. MARSHALL (*Bul. Ent. Research*, 8 (1918), No. 3-4, pp. 269-272).—Under the name *Palaeopus costicollis* the author describes a new weevil from Jamaica, where it is a source of damage to sweet potato tubers, the injury resembling that caused by the "scarabee" (*Euscepes batatae*). *P. grenadensis* from Grenada and *P. subgranulatus* from St. Vincent, which it is thought may have similar habits, are also described as new. A table is given for the identification of the five known species of this genus.

Honeybees and honey production in the United States, S. A. JONES (*U. S. Dept. Agr. Bul.* 685 (1918), pp. 61, fig. 1).—Statistical data relating to honeybees and honey production in this country are presented and discussed. Tabular data are given on the number of colonies of bees on farms; percentage of total

swarming by months; winter confinement, food supply, and protection; losses by disease and in wintering; winter losses, causes and percentage; annual yields of honey per colony; honey production; form in which honey is produced; color of honey; disposition of crops; value of exports of domestic honey, 1911-1917; imports into the United States, 1911-1917; honey prices, 1913-1917; principal plants furnishing nectar and pollen, with average dates of beginning and ending of blooming periods; and sources of surplus honey. The geographical distribution and characteristics of important honeys, and conditions and prospects for 1918, are also discussed.

Beekkeeping and the war, E. F. PHILLIPS (*Sci. Mo.*, 6 (1918), No. 5, pp. 444-449).

Transferring bees to modern hives, E. L. SECHRIST (*U. S. Dept. Agr., Farmers' Bul.* 961 (1918), pp. 14, figs. 5).—The methods by which bees may be transferred to hives with movable combs are here described. It is pointed out that probably one-third of all the bees in the United States are in hives without movable combs.

An unusual disease of honeybees, E. G. CARR (*Jour. Econ. Ent.*, 11 (1918), No. 4, pp. 347-351).—The author records an outbreak of a disease among colonies in Monmouth County, N. J., the symptoms of which are strikingly similar to those of Isle of Wight disease.

The natural enemies of *Chrysomphalus dictyospermi*, E. MALENOTTI (*Redia*, 13 (1917), No. 1, pp. 17-53, pls. 2; *abs. in Rev. Appl. Ent., Ser. A*, 6 (1918), No. 1, pp. 35, 36).—The greater part of this paper consists of descriptions of seven chalcid parasites of *C. dictyospermi*, four of which are ectophagous and three endophagous.

Casca luzonica n. sp., an endophagous parasite of *Schizaspis lobata*, E. MALENOTTI (*Redia*, 13 (1917), No. 1, pp. 73-76, figs. 6; *abs. in Rev. Appl. Ent., Ser. A*, 6 (1918), No. 1, p. 36).—A parasite of *S. lobata* infesting the leaves of *Ficus nota* on the island of Luzon, Philippines, is described as *C. luzonica* n. sp.

Some hymenopterous parasites of economic importance in southern Brazil, J. BRÊTHES (*An. Soc. Rural Argentina*, 52 (1918), No. 1, pp. 7-11, figs. 2).—The species here described are *Lytophilus melanocephalus* n. sp., parasitic on an undetermined lepidopterous larva which injures alfalfa and which may prove to be *Colias lesbia*; *Aphidius brasiliensis* n. sp., parasitic on plant lice; *Heptasmicra brasiliensis* n. sp., which may prove to be a parasite of *Oeceticus*; *Heteroscapus ronnai* n. g. and n. sp., a parasite of an undetermined lepidopterous larva; and *Tetrastichus isis* n. sp., possibly a parasite of *Oeceticus*.

Sex determination and biology of a parasitic wasp, *Habrobracon brevicornis*, P. W. WHITING (*Biol. Bul. Mar. Biol. Lab. Woods Hole*, 34 (1918), No. 4, pp. 250-256, fig. 1).—The hymenopteran here considered is parasitic on full-grown caterpillars of the Mediterranean flour moth.

On a braconid parasite of *Glossina*, R. E. TURNER (*Bul. Ent. Research*, 8 (1917), No. 2, p. 177).—A pupal parasite of *Glossina* is described as *Coelalysia glossinophaga* n. sp.

Chalcidoidea bred from *Glossina* in the Northern Territories, Gold Coast, J. WATERSTON (*Bul. Ent. Research*, 8 (1917), No. 2, pp. 178, 179, fig. 1).—The species *Dirhinus inflexus* n. sp., and *Chalcis amenocles* are recorded from *Glossina*.

New species of bees of the genus *Andrena*, from equatorial Africa, in the American Museum of Natural History, H. L. VIERECK (*Bul. Amer. Mus. Nat. Hist.*, 37 (1917), pp. 235-239).

Contributions to our knowledge of the bee genus *Perdita*, H. L. VIERECK (*Bul. Amer. Mus. Nat. Hist.*, 37 (1917), pp. 241, 242).

Notes regarding ticks found on farm animals in New Zealand, C. J. REAKES (*Jour. Agr. [New Zeal.]*, 16 (1918), No. 2, pp. 83-86).—It is stated that the cattle tick has never been discovered in New Zealand and that tick fever has never appeared on the island. The two varieties of ticks found there are *Ixodes ricinus* and *Hæmaphysalis* sp.

FOODS—HUMAN NUTRITION.

Nutrition and clinical dietetics, H. S. CARTER, P. E. HOWE, and H. H. MASON (*New York: Lea & Febiger, 1917, pp. XVI+646, figs. 6*).—In this book the authors have brought together much material of value to students of nutrition. Part 1 is devoted to a discussion of foods and normal nutrition, part 2 deals with the chemical composition of foods, part 3 discusses the problems of feeding in infancy and childhood, and part 4 takes up feeding in disease. Much of the newer data from the literature of dietetics have been selected and assembled. The etiological factors of the diseases under discussion are given, also the effect of each disease upon metabolism when enough is known to make such consideration seem profitable. No attempt has been made to go into the question of diets for special conditions, such as for the Army and Navy, hospitals, etc.

Food guide for war service at home (*New York: Charles Scribner's Sons, 1918, pp. X+67, figs. 3*).—This book has been prepared under the direction of the U. S. Food Administration in cooperation with the U. S. Department of Agriculture, and the U. S. Bureau of Education, and constitutes a simple statement of the food situation as affected by the war. It has been prepared with special reference to use by elementary and high-school teachers, high-school pupils, and the general public in making "food education" general.

The day's food in war and peace ([*Washington*]: *U. S. Food Admin.* [1918], pp. 108).—Nine lessons, written by experts from the U. S. Food Administration and the U. S. Department of Agriculture are presented. The lessons have been prepared to help the woman in the home meet the food situation, but they are deemed not only applicable for war time but for peace as well. The lessons include the following: Food and the War, by Herbert Hoover; Food for a Day, by G. Lusk; Wheat, Why to Save It and How to Use It, by A. E. Taylor; Conservation of Fats and Sugar, by E. V. McCollum; Meat and Meat Substitutes in War Time, by C. F. Langworthy; Milk and Its Products, by L. H. Mendel; Fruits and Vegetables, by Caroline L. Hunt; The Use of Locally-grown Products and the Development of a Near-by Food Supply, by C. J. Brand; and The Children's Food, by Ruth Wheeler. The introduction was written by Ida M. Tarbell.

The civilian war ration, P. ROSE (*Jour. Amer. Med. Assoc.*, 71 (1918), No. 12, pp. 952, 953).—This article summarizes the results of a study, conducted under the direction of F. G. Benedict at the Nutrition Research Laboratory of the Carnegie Institution on the effects of a reduced diet on metabolism, physical and mental fitness, and endurance. Students in normal health were submitted to a reduction of the daily food allowance sufficient to cause a rapid loss of body weight equivalent to approximately 10 per cent of the weight of the subject at the beginning of the experimental period. The food allowance was then increased and regulated to maintain this body weight for several months. The usual activities of the students were kept up, and numerous tests and observations relative to their metabolism, endurance, and general physical and mental efficiency were made.

It was found that after a 12 per cent loss in weight the net calories required to maintain this weight averaged about 2,300, or approximately one-third less than the original amount required. The actual heat output during sleep, as

computed by indirect calorimetry, was approximately one-fourth less than normal. The heat output per kilogram of body weight and per square meter of body surface was about 18 per cent lower than at the beginning of the study.

During the period of loss in weight and for some time after there was a loss of nitrogen amounting to approximately 150 gm. It is considered that there is an intimate relationship between this "surplus nitrogen" and the metabolic level, removal of this nitrogen evidently lowering the stimulus to cellular activity. The nitrogen output per day was about 9 gm. as compared with an output of from 16 to 17 gm. in the case of the control squad on an unrestricted diet.

The pulse rate and blood pressure were distinctly lowered. With most of the men normal temperatures prevailed. The whole period of lowered food intake had no untoward effect on the physical or mental activities of the subjects.

The author concludes that no hesitancy should stand in the way of adopting for adult civilians war measures for food conservation that would result in enormous gains of supplies without endangering the efficiency of the civilian population. This reduction can safely include proteins as well as carbohydrates and fats.

The fundamental requirements of energy for proper nutrition, G. Lusk (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 12, pp. 821-824, figs. 4).—This is a brief summary of the fundamental requirements of energy for the proper nutrition of boys from birth to 16 years of age, of soldiers at hard work, of men in industrial pursuits, and of women in industrial pursuits. The data given are classified as follows: "(1) Absolutely accurate—basal metabolism of all ages and sexes, and the increase in metabolism due to standing, walking, and carrying a load; (2) approximately accurate—metabolism in industrial pursuits; (3) hypothetic—metabolism of children during exercise."

The author points out that the values given are maximal values based on individuals in better than average nutritive condition and that it is possible to reduce somewhat the basal requirement of energy by undernutrition and thus economize food without detriment to health.

Figures and facts on feeding, E. B. RACE (*Hotel World*, 86 (1918), No. 21, pp. 12, 13).—The steward of a dining room of a large normal school gives here the results of a week's feeding. The amount of food calories that were served to the students, the kind of food, and the cost of serving it are recorded in tabular form.

Welfare and housing, J. E. HUTTON (*New York: Longmans, Green & Co., 1918*, pp. VIII+192, pls. 8, figs. 2).—Three chapters of this book deal with food problems and give results of wartime experience in the feeding of munition workers at the Vickers factories (England). Details of management, sample menus, and comparative appetites of male and female workers are dealt with in the chapter on catering. The chapter on canteens gives details of structure, cost of equipment, and sample menus. The discussion of food values makes reference to the experimental and statistical data contributed by the U. S. Department of Agriculture.

The diet of the negro mother in New York City, A. F. HESS and L. J. UNGER (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 13, pp. 900-902).—This is a report of a dietary study of a group of negro mothers in a district of New York City in which rickets was prevalent.

The authors point out that most of the negroes in this district came from the West Indies, where their diet consisted mainly of vegetables and fruit, and that the sudden change to a diet in which meat is one of the principal ingredients, to the virtual exclusion of fruits and vegetables, may have so altered

the metabolism of the mother and her offspring as to be one of the etiological factors in the production of rickets.

Food control in the United States (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev.*, 7 (1918), No. 2, pp. 137-140).—A statement of the measures for food control in the United States.

Food control in Great Britain (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev.*, 7 (1918), No. 1, pp. 84-94).—A brief summary of food control measures in Great Britain.

Food situation in England (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev.*, 7 (1918), No. 2, pp. 144-146).—A short discussion of food regulations in England.

Food control in France (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev.*, 7 (1918), No. 1, pp. 95-104).—A report of the food control measures in France.

War nutrition and public health in Germany, M. BLITSTEIN (*Vorwärts*, 1918, April 21; trans. in *U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev.*, 7 (1918), No. 2, pp. 148-151).—A short article on nutritive requirements, with special reference to the food situation in Germany.

The food supply of Russia, H. C. SHERMAN (*Polit. Sci. Quart.*, 33 (1918), No. 2, pp. 210-229).—It is shown that bread grains hold a predominant place in the Russian food situation. Wheat and rye are used interchangeably as bread grains, and most of the cultivated lands of Russia are devoted to the raising of these grains. It is popularly believed that an immense surplus of wheat is stored in Russia since the exportation of grain has ceased. The author points out, however, that owing to the increase in population, the diminution of acreage, abnormal economic conditions, and agrarian unrest, the 1917 crop was little if at all in excess of Russia's needs for home consumption.

The oat crop of Russia is strictly devoted to horse feeding, but barley, buckwheat, maize, millet, rice, and sugar are staple crops. It would appear that any decreased production due to the war has been compensated by decreased exportation, so that the amounts of these grains available for home consumption have not been decreased with the exception of sugar, the decreased supply of which is due to difficulty in refining.

The ratio of cattle to people in Russia is only about half as great as in the United States. Roughly estimated, the amount of beef produced and consumed in Russia averages for the entire population about 30 lbs., of mutton about 7 lbs., of pork about 6 lbs., and of fish about 9.3 lbs. per capita per year. Poultry and eggs at the present time are negligible factors of the food supply.

Of the fruit and vegetable crops the only ones regularly included in the official statistics for the country as a whole are potatoes, beans, peas, and lentils, an average of 370 lbs. of potatoes and 17 lbs. of dried legumes being used per person per year.

Beets, cabbage, cucumbers, and onions are used in quantity. The cucumber occupies a very important place in the Russian dietary, an average of 100 lbs. being consumed yearly per person. Russia produces many kinds of fruits and berries, which are consumed locally.

Although the peasants in some localities seem to make use of milk as a part of their daily food, Russia as a whole does not have a sufficient milk supply, the estimate per capita being about 55 lbs. per year.

The author summarizes data as to the adequacy of the Russian food supply as follows: "While it seems certain that under present conditions Russia can have no very large surplus of food, yet her supply appears sufficient for her own needs as regards calories and ample as regards protein, phosphorus,

and iron. The estimated calcium content, however, is undesirably low, as is usually the case in communities having a low per-capita milk supply. The Russian diet appears to consist too largely of bread and other grain products, and too little of milk, vegetables, and fruit, to be well proportioned. In the United States, according to Kellogg and Taylor, bread furnishes 31 per cent, and all grain products 41 per cent of the total calories of the food supply. In France, which shows the largest dependence upon bread of any of the seven countries considered by these authors, bread furnishes 53 per cent and all grain products 58 per cent of the total calories. In Russia, if the above estimates are approximately correct, bread furnishes 59 per cent and all grain products provide 66 per cent of the total calories of the food. A larger use of milk and vegetables would certainly improve the character of the diet from the standpoint of the modern chemistry of nutrition, and would in all probability greatly reduce the death rate of Russia's children and the scurvy rate among the adults of the northern parts of the country."

Milk as a source of water-soluble vitamin, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 537-551, figs. 3; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1657).—The authors discuss the discrepancies in the quantitative relations in the amounts of milk required to furnish the vitamin factor in their own experiments in contrast with those of Hopkins, previously noted (E. S. R., 28, p. 260). Further experiments on the use of dried whole milk, of equivalent amounts of protein-free milk, and of fresh milk are reported which are in agreement with the earlier results on protein-free milk, a much larger amount being necessary to produce a normal rate of growth than was reported by Hopkins.

While unable to explain this difference, the authors state that it seems advisable for the present to use a liberal amount of milk when this is depended upon to supply any considerable proportion of the water-soluble vitamin. The possibility is pointed out of a deficiency in this factor in infant feeding with milk modified by diluting top milk and adding sugar if for any reason the intake becomes less than normal.

The use of Neufchâtel and cream cheese in the diet, K. J. MATHESON and F. R. CAMMACK (*U. S. Dept. Agr. Bul.* 960 (1918), pp. 24-35, figs. 12).—A discussion of the nutritive value of Neufchâtel and cream cheese with recipes for their combination with other foods in cookery.

The food value of eulachon, M. R. DAUGHTERS (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 297-299).—The following analysis is reported of the eulachon, a species of marine fish related to the smelt and found along the Pacific coast from Oregon to Alaska: As purchased, moisture 76.75, protein ($N \times 6.25$) 12.21, ether extract 9.82, and ash 1.56 per cent; edible portion, moisture 74.66, protein 13.18, ether extract 11.21, and ash 1.4 per cent. Tables are also included showing the composition of the aqueous extract and the analytical constants of the fat.

In food value the eulachon is deemed equal to the salmon. It contains a higher percentage of fat than the salmon and in flavor is considered superior. See also a previous note (E. S. R., 33, p. 468).

Commercial stocks of fish (*U. S. Dept. Agr., Food Surveys*, 1 (1918), No. 10, pp. 8, figs. 12).—A report of the stocks of fish on hand January 1, 1918.

Commercial stocks of canned goods (*U. S. Dept. Agr., Food Surveys*, 1 (1918), No. 11, pp. 32, figs. 44).—"The commercial stocks of canned goods covered by the war emergency food survey of January 1, 1918, for which information is here presented, include meats, soup, salmon, sardines, tomatoes, corn, peas, baked beans, miscellaneous canned vegetables, fruits and berries, and preserves, marmalades, jellies, crushed fruits, and fruit sirups."

Digestibility of some seed oils, A. D. HOLMES (*U. S. Dept. Agr. Bul.* 687 (1918), pp. 20).—Continuing previous work with fats (*E. S. R.*, 38, p. 867), the digestibility of certain seed oils was tested by feeding experiments in mixed diet made with human subjects. The results of these experiments are recorded.

An average of 82 gm. of corn oil, 80 gm. soy-bean oil, 90 gm. sunflower-seed oil, 79 gm. Japanese mustard-seed oil, 82 gm. rapeseed oil, and 58 gm. charlock oil was consumed per person per day. The coefficients of digestibility for these oils were found to be 96.8, 97.5, 96.5, 98.8, 98.9, and 98.9 per cent, respectively. The oils apparently effected no unusual effect on the digestibility of the carbohydrates in the diet, consisting largely of starch.

"Considering the results of the digestion experiments as a whole, it is evident that corn, soy-bean, sunflower-seed, mustard-seed, rapeseed, and charlock-seed oils are well assimilated and, judged by their digestibility, should prove satisfactory sources of fat for the dietary."

The velvet-stemmed Collybia—a wild winter mushroom, F. C. STEWART (*New York State Sta. Bul.* 448 (1918), pp. 79–98, pls. 11).—A detailed description is given of this edible mushroom, *Collybia velutipes*, to make certain its identification. Its economic use as food is discussed, and several methods of cooking are described. Tests showing the remarkable capacity of the species for absorption of water are briefly noted.

Sugar substitutes in jelly making, LEONORE DUNNIGAN (*Amer. Food Jour.*, 13 (1918), No. 5, pp. 247, 248, figs. 4).—Results are reported of the use of honey, glucose, fructose, corn sirup, molasses, and sorghum sirup as substitutes for sugar in jelly making with cranberries and apples. Excellent results were obtained with honey and light corn sirup. The flavor was not so good with dark corn sirup, sorghum, and molasses, but the texture was about the same.

The author advocates a marked decrease in the amount of sugar used in jelly making and the extensive use of sugar substitutes. A list of practical references on jelly making is included.

Vegetable foods for the diabetic, RUTH A. WARDALL (*Jour. Amer. Med. Assoc.*, 69 (1917), No. 22, pp. 1859–1862).—Experiments are reported on the effectiveness of different methods of extracting carbohydrates from vegetables to render them suitable for the diet of the diabetic. Tables are given of the results of repeated boiling water extraction and of the comparative results of extractions at boiling temperature and at 60° C.

The data show that repeated water extraction is more effective in removing carbohydrates from some foods than from others. In the vegetables tested the reducing sugars of cauliflower proved most resistant to extraction. Extraction at 60° proved as efficacious as at higher temperatures in most cases, cabbage being a notable exception. The carbohydrate of the carrot and beet can be very readily extracted at this temperature.

Experimental studies on creatin and creatinin.—VIII, The alleged exogenous origin of urinary creatin in the protein of the diet, W. C. ROSE, J. S. DIMMITT, and H. L. BARTLETT (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 601–612; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1657).—In continuation of earlier work (*E. S. R.*, 35, p. 665) the authors have summarized existing theories in explanation of the presence of creatin in the urine and have reported further studies on the influence of high protein diets upon the creatin-creatinin metabolism of normal men and women. The plan of the experiments was to study the output of creatin, creatinin, and total nitrogen following the ingestion of diets alternately low and high in protein content and free from creatin and creatinin. Most of the protein was taken in the form of eggs, milk, and cheese.

Contrary to the findings of Denis and Minot (*E. S. R.*, 37, p. 469) the ingestion of diets excessively high in protein failed to induce the excretion of creatin

in normal men and women. Diets yielding from 3,400 to 3,900 calories per day, whether accompanied by a moderate (13 gm.) or large (27 gm.) nitrogen intake, appeared to exert no appreciable influence upon creatin-creatinin metabolism. It is the opinion of the authors that "no evidence has yet been adduced sufficient to justify the acceptance of a theory which postulates an exogenous origin of urinary creatin in the absence of creatin in the diet."

Proteose intoxications and injury of body protein, III-V (*Jour. Expt. Med.*, 28 (1918), No. 2, pp. 213-252).—Three papers are reported in continuation of investigations previously noted (*E. S. R.*, 37, p. 167).

III. Toxic protein catabolism and its influence upon the nonprotein nitrogen partition of the blood, G. H. Whipple and D. D. Van Slyke.—Experimental evidence is given indicating that "the acute intoxication following an injection of a toxic proteose is usually associated with a large increase (40 per cent or more) in the nonprotein nitrogen of the blood. This increase is found chiefly in the blood urea nitrogen, but the amino and peptid nitrogens also may show small increases. The changes observed in the blood nonprotein nitrogen are identical with those which follow the feeding of large amounts of meat.

"These facts indicate that the proteose intoxication causes an abnormally rapid autodigestion of tissue proteins, but that the nitrogenous end-products are, in chief part at least, the same that result from normal catabolism of food proteins. There is no evidence that the autolytic products play any part in causing the intoxication. The possibility of such a part and a resultant vicious circle is not excluded, but from the available facts the autolysis appears more as a result rather than cause of the intoxication. It appears possible that in disease or intoxication tissue catabolism may be enormously accelerated and yet yield the end-products of normal protein metabolism."

IV. The metabolism of dogs with sterile abscess, pancreatitis, and pleuritis, J. V. Cooke and G. H. Whipple.—Experiments are reported showing that suppurative processes or acute inflammation due to a chemical irritant give the same increased output of urinary nitrogen as does the same inflammatory reaction when caused by some specific bacterial agent. It is considered that the increase can not be explained entirely by a local destruction of tissue with the elimination of the nitrogen derived from these destroyed cells, but is due to the formation of toxic split products in the abscessed area which are absorbed and cause a general intoxication, cell injury, and resultant nitrogen increase.

The conclusion is drawn that a great part at least of the reaction in septic inflammation is nonspecific and results from the primary injury of the host's protein and cell autolysis.

V. The increase in nonprotein nitrogen of the blood in acute inflammatory processes and acute intoxications, J. V. Cooke and G. H. Whipple.—Both sterile abscess formation and septic inflammation in the dog produce a distinct rise in the nonprotein nitrogen in the blood. Many acute infections in man (septicemia, peritonitis, pneumonia, etc.) and certain obscure intoxications show a definite rise in the nonprotein nitrogen and urea nitrogen. In order to explain this retention of protein split products in the body cells and fluids during these intoxications, the authors consider it necessary to determine whether the kidneys' eliminative function for nitrogenous substances is in any way impaired in acute proteose intoxication or other intoxications.

The present status of our knowledge of fatigue products, E. L. Scott (*Pub. Health Rpts. [U. S.]*, 33 (1918), No. 17, pp. 605-611).—"Substances carrying hydrogen ions, as lactic, β -oxybutyric acids, potassium, dihydrogen phosphate, and carbon dioxide, stand as causal agents of fatigue. Certain products of protein disintegration, as indol, skatol, and phenol, may produce fatigue symptoms

and may be active agents in producing normal fatigue. There is some evidence that the negative ion of lactic and β -oxybutyric acids and that certain positive ions, especially that of potassium, are capable of producing certain fatigue phenomena. There is no evidence that the negative ions of carbonic, phosphoric, or sulphuric acids are fatigue substances. There is no evidence at present for the existence of specific fatigue substances as proposed by Weichardt. There is very little probability that creatin or creatinin have any relation to fatigue or to muscle work in general. There are no doubt numerous bodies, as purin bases, uric acid, etc., which may be increased by work, but which have no causal bearing on fatigue."

ANIMAL PRODUCTION.

Genetics.—The rôle of selection in evolution, W. E. CASTLE (*Jour. Wash. Acad. Sci.*, 7 (1917), No. 12, pp. 369-387).—A brief review is presented of the work of Darwin, De Vries, Johannsen, Morgan, Pearl, and others in an effort to demonstrate the rôle of selection in evolution.

The author holds that many biologists at the present time regard selection as an obsolete agency in evolution, and look to mutations and pure lines only for its explanation. Selection and mutation are defined in the light of the work of the investigators named, and the contrasted ideas of Darwin and De Vries outlined. It is maintained that the conclusion reached will depend largely upon the sort of evidence studied, and that paleontology, geographical distribution, classification, and experimental breeding all present evidence which must be weighed before the verdict can be framed.

The attempts to generalize Johannsen's demonstrations of the pure-line principles are discussed, and the work of Pearl with Plymouth Rock fowls, of Morgan with *Drosophila*, of the author with guinea pigs, and of other workers with plants and animals is cited. The conclusion is drawn that the applicability of the pure-line theory in the breeding of animals and plants depends upon how common stable and plastic genes, respectively, prove to be and in what sorts of variations they are involved. "Aside from color," says the author, "there are very few valued economic characters in our domestic animals which are not inherited after the manner of blends." With regard to plants it is asserted that the applicability of the pure-lined principle, outside of those plants that are normally self-fertilized, is very limited, as demonstrated by experiments with corn in progress at the University of Illinois (E. S. R., 20, p. 531). Owing to the fact that in these experiments corn of unprecedentedly high protein and oil content has been obtained, it is held that selection has been the cause of further variation in the direction of selection, and hence an agency in the progressive evolution of a new type.

"Selection, whether natural or artificial, is, as the mutation theory rightly holds, primarily an agency for the elimination of variations, not for their production. It can only act on variations actually existing, and while it can, I believe, continue and extend variation already initiated by shifting in the direction of selection the center of gravity of variation, it can not initiate new lines of variation. It can not change a vertebrate into something else, nor something else into a vertebrate. It is limited to the modification of existing types or organisms, and to their modification in directions in which they show a tendency spontaneously to vary."

The share of egg and sperm in heredity, E. G. CONKLIN (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 2, pp. 101-105).—The fact that the distribution of chromosomes in maturation, fertilization, and cleavage is parallel to the distribution of Mendelian factors has led many students of heredity to regard the cytoplasm

of the germ cells as of no importance in heredity. The highly differentiated cytoplasm of the spermatozoon is either left outside the egg when its nucleus enters or it undergoes a differentiation within the egg; at the same time the egg cytoplasm ceases to form yolk, while the yolk which has been formed is gradually used up in the nourishment of the embryo. Symmetry, asymmetry, and polarity in the adult are derived from the egg and not from the sperm. That the fundamental pattern of egg cytoplasm is not influenced by the spermatozoon is indicated by the following facts: (1) It exists before fertilization or it appears so soon after that it could not have been caused by the sperm. (2) In heterogeneous fertilization the pattern of the egg is not changed by the foreign sperm. (3) Natural or artificial parthenogenesis demonstrates that this pattern exists in the absence of fertilization.

The cytoplasm of the egg is the more or less differentiated body of the embryo. Whenever a character as such is transmitted through the egg cytoplasm and not as factors in the chromosomes of egg and sperm it is not inherited in Mendelian fashion. In each generation the egg contributes more than the sperm to ontogeny. There is cytoplasmic inheritance through the female only, but these cytoplasmic characters are themselves of biparental origin. This is Mendelian inheritance, though somewhat complicated by the fact that every ontogeny has its beginning in the preceding generation.

The collocation of plasmas within the cell, I-II, L. LEGRAND (*Rev. Gén. Sci.*, 28 (1917), No. 12, pp. 368-376; 13, pp. 396-403, figs. 24; *Sci. Amer. Sup.*, 85 (1918), Nos. 2195, pp. 60-64; 2196, pp. 76, 77, figs. 24).—The author attempts by means of diagrammatic figures to represent the structure of the substances which have come to be spoken of as the factors in heredity. Upon these figures a mechanical theory of heredity is advanced.

The constructive hypothesis of the theory rests essentially upon an interpretation of the longitudinal segmentation of the chromosomes which distributes equally between the two daughter cells the chromatin of the mother nucleus. To this concept is added the "very exactly symmetrical arrangement of the spindle with its conductor threads imposing a prepared trajectory upon each chromosomal segment, since it is of supreme importance that certain geometrical relations once established should not be modified in the course of the transfer of the chromosomes; the regularity of situation of each chromatic loop presenting its summit very exactly toward the axis of the spindle and its outward diverging branches, and its impulse along the directive filamentary system, toward the attractive pole, following a movement which is very symmetrical with relation to its congener; finally the preservation of the connective filaments uniting the twin loops during all the phases of the kinesis."

The present theory limits the power of karyokinesis in the transmission of characters in the soma to the three types of nonfixed plasmas (fixed neither to each other nor to the cytoplasmic block), to the exclusion of the specific plasma which is abundant in the healthy animal and during growth. It seeks to establish that all the precision of the successive phases of the kinesis tends to maintain in the daughter cells the arrangement and mode of fixation between them and with the surrounding specific plasma of the various masses of nonfixed plasmas in the position in which they are found after the original amphimixis. It is the interactions of the nucleus and cytoplasm, their zones and their modes of contact, of attraction, and of fixation, which constitute life. "The specific plasma being of maternal origin or of actual digestive synthesis, and the non-fixed plasmas reconstituting themselves approximately in substance and in mode of fixation, in form and in substance, until the cessation of the formative cytodiereses, we perceive that in the fecundated ovule everything is provided for the building up of a new organism."

Sex determination and sex differentiation in mammals, F. R. LILLIE (*Proc. Nat. Acad. Sci.*, 3 (1917), No 7, pp. 464-470).—The author points out the possibility for complete reversal of the indicated sex differentiation in mammals after zygotic sex determination has taken place and discusses in its bearing on this question the development of the female or freemartin of two-sexed twins in cattle (*E. S. R.*, 35, p. 169). It is contended "on the basis of the present results that sex determination in mammals is not irreversible predestination, and that with known methods and principles of physiology we can investigate the possible range of reversibility."

The control of the sex ratio, O. RIDDLE (*Jour. Wash. Acad. Sci.*, 7 (1917), No. 11, pp. 319-356, fig. 1).—An outline is given of experimental attempts that have been made to learn the nature of sex and to control the sex ratio and the development of sex. Hybridization experiments by the author and others with wild doves and pigeons and other forms are reviewed, from which it is noted that as the "width of the cross" is increased a relatively higher proportion of males is produced. From these and other investigations the author concludes that the male sex is an expression of metabolism at a higher level, and the female sex of a metabolism at a lower or more conservative level. Reviewing work on the composition of the yolk of pigeons' eggs (*E. S. R.*, 37, p. 772), the author concludes that the sex actually realized corresponds in fact to the levels or grades of metabolism, and notes that the measured metabolism "was complete before the beginning of maturation, so that if such a differential maturation should occur it must be looked upon not as a cause but rather as a result of the establishment of that grade of metabolism which does here and under all of the several known conditions in the clearest way accompany and correlate with each particular sex."

Summing up the work with pigeons, it is noted that sex and such characters as fertility and developmental energy not only bear initial relations to the order of the egg in the clutch, but that sex and these other characters are progressively modified under stress of reproductive overwork, until at the extreme end of the season certain aspects of femininity are abnormally or unusually accentuated. Sex is therefore considered a quantitative modifiable character.

The article closes with a brief survey of some experimentally induced and puzzling sex ratios, of facts of sex that have been shown by studies of embryonic and postnatal stages of organisms, and of the effects of castration, gonad-plantation, and gonad-extract injection. A list of cited literature is given.

[Uses of velvet beans as feed], S. M. TRACY and H. S. COE (*U. S. Dept. Agr., Farmers' Bul.* 962 (1918), pp. 30-36, 38, 39).—Notes are given on the composition of velvet beans and velvet bean meal, and feeding experiments by various State experiment stations to determine the value of velvet beans as feed for steers, dairy cows, and pigs are reviewed. These experiments for the most part show the value of velvet beans as compared with cottonseed meal.

Some unpublished experiments on feeding velvet beans by a number of southern stations are briefly reviewed by D. W. May. At the Tennessee Station 9 lbs. of velvet bean meal was hardly equal to 6 lbs. of cottonseed meal for dairy cattle. The cattle readily ate the rations containing velvet bean meal. In two tests at the Florida Station rations containing velvet bean meal produced milk more cheaply than those containing cottonseed meal. The Tennessee Station found that when velvet beans in pod composed more than one-third of the rations they were unpalatable for hogs. Pigs gained 0.916 lb. daily and required 4.68 lbs. of feed per pound of gain at the South Carolina Station on a ration of velvet bean meal and corn meal (2:1), while those fed soy bean meal and corn meal (2:1) gained 0.548 lb. per day and required 7.24 lbs. of feed per pound of gain.

Feeding and grazing steers, A. P. KERR (*Louisiana Stas. Rpt. 1917, pp. 12, 13*).—Palm kernel meal was compared with peanut meal as a supplement for Japanese cane silage, two lots of 10 steers each being fed for 90 days. The steers on palm kernel meal gained an average of 1.55 lbs. per head daily, and those on peanut meal 1.19 lbs. The steers grazing on corn and velvet beans during November and December failed to make satisfactory gains.

Fertilizing constituents excreted by two-year-old steers, H. S. GRINDLEY, H. W. MUMFORD, A. D. EMMETT, and S. BULL (*Illinois Sta. Bul. 209 (1918), pp. 129-162; abs., pp. 8*).—This bulletin gives results of a study of the amounts of nitrogen, phosphorus, and organic matter excreted by steers, whether these elements are excreted via the feces or the urine, and the commercial value of the fertilizing elements of the excreta. No bedding was used in the experiments, and hence its fertilizing value is not considered. The 8 Hereford steers used during the 7 weeks of the experiment were fed in digestion and metabolism stalls. The rations and feed consumption of the four lots have already been noted (E. S. R., 37, p. 471). The average daily gains per steer were 0.76 for the maintenance lot, 1.28 lbs. for the one-third feed lot, 1.76 lbs. for the two-thirds feed lot, and 2.05 lbs. for the full-feed lot.

The following table shows the amount of organic matter, nitrogen, and phosphorus excreted, expressed in percentage of the amount consumed:

Excretion of organic matter, nitrogen, and phosphorus by steers.

Period.	Weeks.	Ratio of hay to corn to linseed meal.	Organic matter in feces.	Nitrogen.			Phos- phorus in feces. ¹
				Total.	Proportion in feces.	Proportion in urine.	
1.....	1-5	1:1:0	<i>Per cent.</i> 33.20	<i>Per cent.</i> 81.82	<i>Per cent.</i> 68.53	<i>Per cent.</i> 31.47	<i>Per cent.</i> 92.77
2.....	8-13	1:3:0	27.89	86.53	58.63	41.32	95.81
3.....	17-22	1:5:0	24.24	86.72	56.16	43.84	84.92
4.....	25-30	1:4:1	21.85	80.97	35.96	64.04	80.61
5.....	34-37	1:4:1	22.75	92.56	35.25	64.75	80.82
Total.....	1-37	.....	26.24	87.40	49.82	50.18	86.51

¹ Omitting 1 steer.

Practically all the phosphorus excreted was in the feces, except in the case of one steer excluded from the table, whose urine contained 20 times as much phosphorus as the urine of some of the other steers.

The amount of feed consumed had no influence upon the percentages of nitrogen and phosphorus excreted. This was also true of the organic matter excreted, except in period 1 and possibly period 2.

Slightly more organic matter was recovered in the manure than would have been recovered in a system of farming in which the corn is sold and the clover plowed under. When linseed meal was introduced into the ration, 160 per cent as much nitrogen and 141 per cent as much phosphorus was excreted as was contained in the farm-grown feeds.

Valuing nitrogen at 15 cts., phosphorus at 10 cts., and potassium at 6 cts., and assuming that 90 per cent of the potassium consumed was excreted, the commercial value of the manure was 36 per cent of the cost of the feed in period 1, 27 per cent in period 2, 24 per cent in period 3, 32 per cent in period 4, 29 per cent in period 5, and 29 per cent in the entire experiment.

Helpful hints to hog raisers, C. M. VESTAL (*California Sta. Circ. 201 (1918), pp. 7*).—A few pointers are suggested for the purpose of stimulating interest

and giving aid to those engaged in raising hogs. A gestation calendar for sows is included.

Hog grazing crops, A. P. KERR (*Louisiana Stas. Rpt. 1917, p. 13*).—Hogs fed peanut meal, from which the oil had been extracted, on dry lot produced better gains than those fed palm kernel meal, but the peanut meal ration resulted in softer meat than the palm kernel meal ration. Both the above rations were balanced with corn chop.

Hogs grazing on corn and velvet beans refused to eat the immature beans, and by the time the beans were dry and palatable the corn had been consumed. The hogs made fairly good gains.

A simple hog-breeding crate, J. H. ZELLER (*U. S. Dept. Agr., Farmers' Bul. 966 (1918), pp. 4, fig. 1*).—Brief directions are given for the construction and operation of a hog-breeding crate.

Mineral content of southern poultry feeds and mineral requirements of growing fowls, B. F. KAUPP (*Jour. Agr. Research [U. S.], 14 (1918), No. 3, pp. 125-134, pl. 1*).—This is a report of work done at the North Carolina Experiment Station upon the mineral matter required in the production of broilers. The investigation attempted to ascertain (1) the amount of mineral per unit in the bodies of the baby chick and of the 1.5-lb. broiler; (2) the mineral content of the southern poultry feeds; (3) a proper feed mixture from the standpoint of protein, carbohydrate, and fat; (4) the mineral content of this mixture; and (5) by feeding, whether the minerals of the feed mixtures were in sufficient quantities for the greatest rate of growth possible. Tabulated data show the mineral content of the bodies of the fowls, the mineral content of the feeds used, and the mineral intake, outgo, and balance of the chicks by periods during the experiment.

It was found that the mineral content of southern poultry feeds varies in different kinds of feed and in different lots of the same kind. This difference is influenced by weather conditions, such as drought, and by the different mineral contents of the soil.

To produce 1 gm. of gain in weight required 7.49 gm. of milk, 2.91 gm. of mash and grain, and 1 gm. of green feed. An average of 75.2 per cent of the carbohydrates and 80.2 per cent of the fat was digested by the chicks.

The results indicate that to supply the proper amount of phosphorus, magnesium, and calcium to growing chicks in mashes consisting of such mill feeds as middlings and ground oats there should be added meat and bone meal, or bone meal, or meat meal. Sour skim milk and buttermilk, if given in sufficient quantities, aid in making good the mineral shortages as well as providing food hormones.

Cost of raising cockerels for broilers, G. R. SHOUP (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 4, pp. 55-57*).—In this experiment 100 supposed cockerels were selected from a room-brooder flock of 4-week-old chicks. At this time they weighed an average of 6.32 oz. Five of the chicks died and 5 turned out to be pullets. The 95 were fed to the end of the ninth week, and the 90 cockerels were then crate-fattened for 10 days and marketed. The rations consisted of sprouted oats, dry mash, scratch feed, and milk.

The 90 birds weighed 96 lbs. at market, and the cost of feed for the 95, including heat but not labor and overhead expenses, was \$16.55. The receipts less express were \$28.04. From this test it is estimated that the cost of day-old chicks is about 15 cts.; raising to four week, 15 cts.; and four weeks to market age, 17.5 cents; making the cost of raising broilers about 47.5 cts. per pound.

Meat scrap and sour milk for egg production, H. L. KEMPSTER and G. W. HERVEY (*Missouri Sta. Bul. 155 (1918), pp. 3-16, figs. 4*).—That part of this

bulletin reporting results of feeding meat scrap and sour milk and linseed meal, gluten meal, and cottonseed meal for egg production, is a reprint of Circular 82, already noted (E. S. R., 37, p. 774).

A further series of tests was conducted from November 1, 1916, to October 31, 1917, in which meat scrap, cottonseed meal, and gluten meal, alone and in combinations, supplied the basal protein. Ten lots of 10 White Leghorns each were used. In addition to the protein, the birds were fed a mash of equal parts by weight of bran, shorts, and corn meal. Lot 10 received the mash alone. The amount of protein-fed lots 1 to 9 was the same. The following table shows some of the results obtained:

Results of tests of protein feeds alone and in combination for laying hens.

Lot.	Source of basal protein.	Eggs laid per hen.	Feed required per pound of eggs.	Profit or loss (—) per lot.
			<i>Pounds.</i>	
1	Meat scrap.....	134.7	4.2	\$12.96
2	Meat scrap, cottonseed meal (2:1).....	127.5	4.1	13.53
3	Meat scrap, cottonseed meal (1:2).....	97.9	5.2	6.98
4	Cottonseed meal.....	59.6	8.5	-2.17
5	Cottonseed meal plus 5 per cent bone ash.....	83.4	6.4	2.87
6	Meat scrap, gluten meal (2:1).....	106.8	4.9	8.13
7	Meat scrap, gluten meal (1:2).....	115.2	4.6	10.38
8	Gluten meal.....	58.8	9.2	-3.65
9	Gluten meal plus 5 per cent bone ash.....	92.9	5.4	5.97
10	Check pen.....	63.7	7.8	-0.34

DAIRY FARMING—DAIRYING.

Clover v. alfalfa for milk production, C. C. HAYDEN (*Ohio Sta. Bul.* 327 (1918), pp. 3-36).—A series of four experiments covering a period of four years and involving 36 cows is reported. Alfalfa and clover were fed alternately to each lot, and the feeding periods were made as long as possible. Exclusive of the hays, the rations were identical, and consisted of ground corn and corn silage in the first and fourth tests, and ground corn, wheat bran, corn silage, and corn stover in the second and third tests. The clover hay in the first test was not of good quality.

Some of the results obtained are set forth in the following table:

Clover v. alfalfa for milk cows.

Test.	Production.		Feed consumed.					
	Milk.	Fat.	Corn.	Bran.	Silage.	Stover.	Clover.	Alfalfa.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Clover periods:								
First.....	8,779.4	340.7	3,068.0	.....	11,334.0	.....	4,908.0	.....
Second.....	9,280.0	403.4	2,185.0	1,092.5	10,746.0	1,190.5	3,444.5	.....
Third.....	5,591.8	243.5	1,381.2	690.6	6,952.8	838.2	2,271.0	.....
Fourth.....	7,704.0	292.2	2,137.5	.....	8,526.0	.....	4,253.0	.....
Total.....	31,365.2	1,278.8	8,771.7	1,783.1	37,558.8	2,028.7	14,876.5	.....
Alfalfa periods:								
First.....	10,832.7	412.2	3,301.5	.....	12,747.4	.....	.....	6,279.0
Second.....	10,316.6	438.3	2,521.0	1,260.5	12,455.6	1,354.4	.....	4,200.0
Third.....	5,578.4	230.7	1,411.2	705.6	7,045.5	901.5	.....	2,327.1
Fourth.....	7,543.6	293.1	2,137.0	.....	8,536.0	.....	.....	4,256.3
Total.....	34,271.3	1,374.3	9,370.7	1,966.1	40,784.5	2,255.9	.....	17,062.4

"The alfalfa rations contained 31.8 per cent more protein than the clover rations and 8.2 per cent more carbohydrates and fat, but the cows on alfalfa produced only about 9.5 per cent more milk. The average nutritive ratio during the four tests was 1:8.6 for the clover rations and 1:7 for the alfalfa rations.

"In test I the cows on clover lost in weight about 1 lb. daily in both periods, while those on alfalfa gained about 0.7 lb. daily in both periods. In test II the cows on clover lost about 0.7 lb. daily, while those on alfalfa gained in the first period and lost in the second period with an average loss of about 0.1 lb. daily. In test III the cows on clover lost during the first period and gained about an equal amount during the second period, while those on alfalfa gained during the first period and lost about an equal amount during the second period. In test IV both lots lost slightly in the first period and gained slightly in the second period.

The nutrients consumed per 100 lbs. of milk were for the clover periods 7.86 lbs. of protein and 67.9 lbs. of carbohydrates (plus 2.25 times the fats). The corresponding amounts for the alfalfa periods were 9.49 and 67.19 lbs., respectively.

"The results of these tests indicate that a unit of clover protein is more efficient in milk production than a unit of alfalfa protein."

The milk and fat production and feed consumption of the individual cows in each experiment are summarized in tabular form in the appendix.

Correlation between the percentage of fat in cow's milk and the yield, E. ROBERTS (*Jour. Agr. Research* [U. S.], 14 (1918), No. 2, pp. 67-96, figs. 2).—In this investigation, which was made by the laboratory of genetics of the Illinois Experiment Station, the data were for the most part obtained from the registers of the different American dairy cattle associations. Only the yearly tests were used. The relation between the percentage of fat and the yield of milk was obtained by means of the correlation table. The cows are grouped, according to age when the test began, into the following classes: Two to 3 years, 3 to 4 years, 4 to 5 years, and 5 years and over.

It is concluded that "a significant negative correlation exists between the percentage of fat in cow's milk and the yield for the Jerseys, Guernseys, Holstein-Friesians, grade Jerseys, grade Holstein-Friesians, and cows unclassified as to breed. The correlation for Ayrshires is not significant in the subgroups classed in respect to age, but it is significant when these groups are treated as a whole.

"The yield of milk increases with age. However, since all cows 5 years of age and over are classed together, it may well be that the yield decreases at some period beyond 5 years. . . . In the Jerseys, Guernseys, and Holstein-Friesians the percentage of fat remains fairly constant for the different ages studied. However, the group 5 years of age and over in the Jerseys and Guernseys shows a slightly lower percentage of fat than the younger groups. In the case of the Ayrshires there is a gradual decrease with age. Between the youngest and oldest groups there is a difference of 0.151 per cent. When judged by the standard deviation age has no influence on the variability of the percentage of butter fat. But the class 5 years of age and over is more variable in the yield of milk than the younger groups. This may occur because of the inclusion in this group of old cows whose milk yield has decreased.

"The breed has an influence on the variability of milk yield and percentage of fat, using the standard deviation as a basis of comparison. For variability in yield the breeds stand in the following order in an ascending scale: Jersey, Ayrshire, and Guernsey practically the same, Holstein-Friesian. For percentage of fat the order is: Holstein-Friesian and Ayrshire about the same, Guernsey, Jersey. For the production of milk the breeds stand as follows: Holstein-Friesian 14,443.1, Ayrshire 9,471.1, Guernsey 8,644.4, and Jersey 7,491.4 lbs.

The average percentages of fat for the different breeds are as follows: Jersey 5.392, Guernsey 5.033, Ayrshire 3.933, and Holstein-Friesian 3.435 lbs."

Hemolytic substances in heated milk and in milk cultures of *Bacterium welchii*, W. W. FORD and J. H. LAWRENCE (*Bul. Johns Hopkins Hosp.*, 28 (1917), No. 318, pp. 245-249).—An investigation of the hemolytic action of the whey from decomposed milk and from pure milk cultures of *B. welchii* is reported.

Samples of Baltimore market milk heated to 85° C. for 15 to 20 minutes and incubated at 22° or at 37° for 24 to 48 hours exploded violently with or without a subsequent peptonization. The fluid from such decomposed milk after filtration had hemolytic properties.

"The hemolysin of this milk is independent of the acids in the milk, occurring in neutralized specimens; is thermolabile, being destroyed at temperatures between 55 and 60°; is precipitable by ethyl alcohol; and can be digested by pepsin and pancreatin. It is to be classed with the bacterial hemolysins and is in all probability to be attributed to the presence of *B. welchii* in the market milk. Pure milk cultures of *B. welchii* contain a similar hemolysin, which is, however, usually slightly more powerful. This also is independent of the acids in the milk; is thermolabile, being destroyed at temperatures between 55 and 60°; is precipitable by ethyl alcohol; and can be digested by pepsin and pancreatin."

The results thus far secured indicate that this hemolysin is a true bacterial hemolysin and distinct from that of both lactic acid and butyric acid. The rôle of these acids in the hemolysis noted in cultures of *B. welchii* is thought to be secondary to that of the true bacterial hemolysin secreted by the organism.

A plan for controlling the milk supply of the small town, P. WERNER, JR. (*Jour. Dairy Sci.*, 1 (1917), No. 3, pp. 284-289).—In connection with a sanitary survey of the milk supply of St. Charles, Mo., by the Missouri Experiment Station a series of direct microscopic counts of bacteria was made of milk samples preserved in formalin. These counts, made from milk from two to five days old checked so perfectly with the counts from fresh milk that additional experiments were planned to determine the possibility of making the counts from preserved samples at a central laboratory instead of in the field.

In order to determine whether the addition of formalin to milk would interfere with the successful grading of milk by preventing the staining of bacteria, microscopic counts were made of whole milk of varying sanitary grades, after which each sample was preserved in a closed container with formalin in the proportion of 500:1. Counts were again made from each of the preserved samples after from two to five days. Of over 50 samples counted, all but 3 would have been put in the same grade whether the count was made on the fresh or the preserved samples. In the author's opinion the laboratory control of the small milk supply could be easily and practically carried on by a central State laboratory where preserved samples of milk could be sent for analysis.

Marketing practices of Wisconsin and Minnesota creameries, R. C. PORRS (*U. S. Dept. Agr. Bul.* 690 (1918), pp. 15, figs. 5).—The more important phases of the market practices by the creameries of Wisconsin and Minnesota and the market distribution of creamery butter are presented.

The average shrinkage of a number of shipments of Wisconsin butter was 0.399 lb. per tub when shipped to Chicago and 0.418 lb. per tub when shipped to New York. Minnesota butter shrank 0.21 lb. per tub to Chicago and 0.217 lb. per tub to New York.

It is noted that "the great majority of creameries in Wisconsin and Minnesota usually produced a quality of butter for which there was an active market demand. The comparative ease with which creameries have been able to contract or to sell their butter to wholesale receivers has not necessitated the

employment of expert salesmanship. With traveling representatives of wholesale receivers willing to contract for the yearly outputs of the creameries and the contracts with receivers frequently renewed year after year, individual rather than cooperative action among creameries in marketing butter has prevailed. In most instances the creameries have been well satisfied with the returns received, and therefore the necessity of cooperation among creameries has not been strongly apparent. Thus the efforts toward organizing cooperative marketing federations of creameries for marketing butter independent of the regular wholesale outlets have never found much favor or been developed to any great extent."

A study of prices and quality of creamery butter, G. P. WARBER (*U. S. Dept. Agr. Bul. 682 (1918), pp. 22, figs. 3*).—A report of an investigation of the sources of butter supply of more than 50 of the largest cities of the United States, involving over 1,000 creameries, the prevailing grade or quality of butter sold in different markets, and the prices paid for different grades.

Average scores of creamery butter sold to all classes of trade in Philadelphia and Chicago in the winter of 1914-15, as indicated by the scoring of one judge, were one point lower than the average scores of butter sold to the most select grocery trade. The difference between the scores of these two representative lots of butter was 0.9 point in New York and 0.5 point in St. Paul and Minneapolis. The fact that large local centralizer creameries are in a position to deliver freshly churned stock three or four times a week to retail groceries makes it difficult for country creameries to establish a dependable market for their best grades of butter at prices above the usual wholesale prices in such cities. The average score of 120 lots of country creamery butter in St. Paul and Minneapolis was 89.96, as compared with a score of 89.39 for 220 lots of centralizer brands.

Comparative data are given of the volume of business, the kind of butter and butter substitutes handled, the selling prices, and the margins at which butter was handled by different kinds of retail establishments.

These studies show that "the highest retail prices are paid for creamery butter which is sold under a trade-mark or brand that is generally recognized among consumers as a guaranty of uniform excellence of quality. Generally, however, only those creameries which are located in large cities or whose outputs are sufficient to enable them to establish their own marketing organizations in distant centers of population have been able to arrange to have their butter sold under their own distinctive brands or trade-marks. The unusually high prices obtained for certain 'special brands' of butter sold in Philadelphia and New York suggest the possibility of increasing greatly the market returns of creameries making 'States Brand Butter,' provided such butter is sold to the consumers under the exclusive brands of the creameries.

"Retailers and consumers might also, with advantage to themselves, improve their buying methods. Small grocers and proprietors of delicatessen shops often pay higher prices for butter of comparatively inferior quality than larger dealers pay for butter of choice quality. Cooperative buying associations among the retailers of some cities in which an expert judge of butter quality does the buying have overcome some of the difficulties encountered by retailers who buy as individuals in competition with the larger retailing organizations."

Neufchâtel and cream cheese: Farm manufacture and use, K. J. MATHESON and F. R. CAMMACK (*U. S. Dept. Agr., Farmers' Bul. 960 (1918), pp. 3-24, figs. 12*).—Notes on the characteristics of the Neufchâtel group of cheeses are followed by detailed directions for the manufacture and marketing of Neufchâtel and cream cheese. Data are given upon the cost of manufacture and equipment needed for the making of these cheeses.

It is estimated that 100 lbs. of 4 per cent milk will yield 12 lbs. of cream cheese, and 12 lbs. of cottage cheese from the skim milk. The yield of pimienta cream cheese is estimated at 13 lbs. and of Neufchâtel cheese about 15 lbs. per 100 lbs. of milk. The estimated cost of manufacture per 3-oz. package for cream cheese is 4.48 cts., for pimienta cream cheese 6.99 cts. per jar of 4 oz., and for Neufchâtel cheese 3.33 cts. per package (2.5 oz.). At current prices for these cheeses and the above costs of manufacture, 100 lbs. of 4 per cent milk should return \$9 for cream cheese, \$8.85 for pimienta cream, and \$8.40 for Neufchâtel.

Pasteurized milk for cheese making, J. J. DUNNE (*Hoard's Dairyman*, 55 (1918), No. 11, pp. 466-468).—A review of the progress of pasteurization in cheese making in Denmark. Notes are given on the effect of the war upon the Danish cheese industry, and on the making of Gervais cheese.

VETERINARY MEDICINE.

Veterinary post-mortem technique, W. J. CROCKER (*Philadelphia and London: J. B. Lippincott Co.*, 1918, pp. XIV+233, pl. 1, figs. 141; rev. in *Cornell Vet.*, 8 (1918), No. 2, p. 144).—This work, written to fill a gap in American veterinary literature which has long been felt by the author in teaching post-mortem pathology, includes chapters on the autopsy room, post-mortem instruments, external examination, internal examination of the horse, of ruminants, of swine, of the dog and cat, and of the mouse, guinea pig, rabbit, fowl, and elephant, technique and description of organs, and post-mortem protocol and report.

Animal parasites and human disease, A. C. CHANDLER (*New York: John Wiley & Sons, Inc.*, 1918, pp. XIII+570, figs. 254).—The several parts of this work deal with the Protozoa (pp. 26-195), "worms" (pp. 196-321), and arthropods (pp. 322-528).

Conservation of live stock by controlling animal diseases, J. R. MOHLER (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp.*, 6 (1917), pp. 220-232).

Report of practitioner's short course in veterinary medicine, Iowa State College of Agriculture and Mechanic Arts (*Off. Pub. Iowa State Col. Agr.*, 16 (1917), No. 23, pp. 348, pls. 60).—This report includes lectures given by D. S. White and J. W. Adams, as well as by veterinarians of the faculty.

Proceedings of the Wisconsin Veterinary Medical Association, edited by F. B. HADLEY (*Proc. Wis. Vet. Med. Assoc.*, 3 (1918), pp. 102, figs. 7).—Among the papers here presented are the following: Eradication and Control of Bovine Tuberculosis, by O. H. Eliason (pp. 23-29); Bovine Tuberculosis from the Breeder's Viewpoint, by O. Toepfer (pp. 29-31); Testing Cattle for John's Disease, by W. R. Claussen (pp. 32-35); Hog Cholera Control, by J. T. Purcell (pp. 39-41); An Outbreak of Rabies in Waukesha County, Wis., by H. Lothe (pp. 49-51); Sterility in Cattle, by T. H. Ferguson (pp. 52-54); Federal Aid for Tuberculosis Control, by J. E. Gibson (pp. 55-57); The Relation of the Department of Agriculture to the Control of Diseases, by C. P. Norgord (pp. 65-72); Shipping Fever, by R. A. Garman (pp. 74, 75); and Hemorrhagic Septicemia, by O. H. Eliason, J. B. Collins, and W. R. Claussen (pp. 75-77).

[Report of the] health of animals branch, M. BURRELL (*Rpt. Min. Agr. Canada*, 1917, pp. 61-71).—A report upon the occurrence of, and work of the year with, infectious diseases of live stock.

Annual report of the Bengal Veterinary College and of the civil veterinary department, Bengal, for the year 1916-17, A. SMITH (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept.*, 1916-17, pp. [30]).—This is the usual annual report (*E. S. R.*, 37, p. 780).

Slaughterhouse reform, showing the results of inquiries as to the progress of the movement in favor of humane methods in killing animals used for food, S. M. DORINGTON (*London: Council of Justice to Animals, 1917, pp. 15, figs. 7*).—A compilation of information, based upon a questionnaire, on humane killing in Denmark, Sweden, Norway, and Finland, with additional data from several English and other public slaughterhouses and bacon factories.

The specificity of the Abderhalden reaction, W. N. BOLDYREFF (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 18, pp. 882-884; abs. in Rec. Méd. Vét., 94 (1918), No. 9, pp. 270, 271*).—The author considers the Abderhalden reaction to be intimately connected with digestion. During the period of activity of the digestive apparatus enzymes, including the proteolytic enzymes, are absorbed by the blood, and at this time the Abderhalden reaction is positive in the case of practically any protein substance. During the period of repose the reaction, even in pregnancy, is always negative. The Abderhalden reaction is consequently of value for detecting the presence of proteolytic enzymes in the blood, but it is not specific.

Peptic and tryptic digestion products as inexpensive culture mediums for routine bacteriologic work, J. E. STICKEL and K. F. MEYER (*Jour. Infect. Diseases, 23 (1918), No. 1, pp. 68-81*).—Practical methods recommended for the manufacture of amino acids have been applied to the preparation of routine culture media from animal proteins which can not be used as food or which have been treated in such a way that the nutritive value has been destroyed. The following products have been investigated: Tryptic digestion of human placenta, peptic and tryptic digestion of beef and sheep blood, peptic and tryptic digestion of pig or beef liver, tryptic digestion of beef heart and "pancreatin medium," tryptic digestion of casein, and autolysis of pigs' and dogs' livers.

The media thus formed are inexpensive, and on account of the high amino-acid content are considered superior to the usual standard media. Detailed directions for their preparation are given, together with experimental data on their use with different organisms.

"Hormone" medium, a simple medium employable as a substitute for serum medium, F. M. HUNTOON (*Jour. Infect. Diseases, 23 (1918), No. 2, pp. 169-172*).—In the preparation of the media described the following factors were kept in mind: (1) To extract the growth factors or hormones by bringing colloidal solutions, such as melted agar or gelatin, into contact with meat and blood, (2) to preserve these factors by limiting the amount of heating as much as possible and by not filtering the solutions, (3) to furnish sufficient amino acids by the use of a suitable peptone and the addition of egg yolk, (4) to keep the hydrogen-ion content in the proper zone, and (5) to simplify the technique so that the media can be produced under the most unfavorable conditions.

The media described, in all of which the hormones are furnished by chopped beef heart or steak, are hormone agar, which is said to be available for all usual laboratory uses and to have a growth value ten times as great as standard agar and at least as good as average-grade serum agar; hormone semisolid agar, which is especially suitable for the preservation of stock cultures; and hormone gelatin broth, in which the growth of practically all organisms is more rapid and their peculiar characteristics are exaggerated.

The immunologic properties of uveal pigment, A. C. WOODS (*Jour. Immunol., 3 (1918), No. 2, pp. 75-92, fig. 1*).—A study of the antigenic properties of the uveal pigment of the eye was made in the course of a detailed study of the anaphylactic theory of sympathetic ophthalmia.

It was found that "the pigment of the uveal tract of the eye possesses the properties of acting as antigen in homologous animals, and in its immunologic reactions is organ specific and not species specific. These findings can be

demonstrated by the complement-fixation reaction with the sera of properly immunized animals, and by perfusion experiments on the eyes of sensitized animals. In the case of the perfusion experiments, the anaphylactic reaction is manifested by a marked contraction of the pupil, and the occurrence of small hemorrhages in the fundus. This reaction was used to study the antigenic properties of uveal pigment, and the results shown by complement fixation confirmed."

The isolation, purification, and concentration of immune bodies: A study of immune hemolysin, M. KOSAKAI (*Jour. Immunol.*, 3 (1918), No. 2, pp. 162-180, figs. 4).—The literature on the problem of obtaining immune bodies from their sera and on hemolysin studies is reviewed, and experiments conducted by the author with the immune hemolysin of the rabbit against sheep's blood are described. The isolation of hemolytic amboceptor from its antigen union was brought about by the following method:

"When the hemolytic power of the original immune serum is 1:10,000 it is diluted to 100 times its volume with physiological salt solution; 5 cc. of this diluted serum is poured into 4 cc. blood cells, which are washed free from serum protein with physiological salt solution. After from 15 to 20 minutes at room temperature all of the hemolytic amboceptor has been adsorbed by blood cells, and the antigen-amboceptor union is thus obtained. After the sensitized corpuscular sediment is washed with physiological salt solution several times, till the last trace of serum protein has been removed, this pure antigen-amboceptor combination is mixed with an isotonic or slightly hypertonic watery solution of saccharose, glucose, or lactose and left at 55° C. for from 15 to 30 minutes, during which time the vessel is shaken several times.

"The sugar extract, which contains nearly all of the hemolysin used to sensitize the cells, is obtained by centrifugation. In order to purify this sugar extract, which contains substances from destroyed blood cells, it is placed in a separatory funnel and shaken for from one to two hours with from 5 to 10 volumes of ether, this treatment, if necessary, being repeated twice or thrice, till at last the solution becomes quite colorless. This colorless solution is dialyzed in parchment against running water in order to eliminate the sugar and traces of salt. The solution thus obtained is concentrated in vacuo to the required volume.

"The reversibility of the antigen and amboceptor union is proved to be practically complete, so far as the immune hemolysin of the rabbit against sheep's blood is concerned."

Free antigen and antibody circulating together in large amounts (hemagglutinin and agglutinin in the blood of transfused rabbits), P. ROUS and O. H. ROBERTSON (*Jour. Expt. Med.*, 27 (1918), No. 4, pp. 509-517, pls. 2).—In rabbits transfused almost daily with the whole citrated blood of other rabbits, an unusual condition often develops, manifesting itself in an almost immediate clumping together of all the red cells in specimens of the shed blood. This clumping is considered to be due to an agglutinating principle which circulates with the corpuscles against which it is effective. Under ordinary circumstances intravascular clumping is prevented because the union of antigen and antibody can take place only at a temperature several degrees below that of the body. In defibrinated blood, gradually cooled, clumping is first noted at 35° C., the agglutination increasing with the fall of temperature. The reaction is apparently completely reversible, the response to temperature changes being extremely prompt. When once elicited, the agglutinating principle may persist for a long time after the transfusions are stopped.

Further studies on the preservation of complement by sodium acetate, B. W. BEAMY (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 26, pp. 2000, 2001).—The

author summarizes as follows the properties of sodium acetate which make it an ideal agent for the preservation of complement, as previously noted (E. S. R., 38, p. 80):

"It has no hemolytic action. It is not anticomplementary. The solution can be sterilized. Dissolved in physiologic sodium chlorid solution, it has the same hydrogen ion concentration as blood, P_H 7.4. It preserves and stabilizes complement from two to three months in the ice box, or two weeks at room temperature. It can be used in any strength from 5 to 50 per cent, or in crystal form. Its preservative properties are not antibacterial and, therefore, must be physico-chemical. Added to the whole blood in certain strengths it prevents coagulation. It will preserve human complement."

In view of the evident loose chemical combination of complement with sodium acetate, the author suggests the possibility that complement is an enzyme of definite chemical constitution. The use of sodium acetate in place of sodium citrate in blood transfusion is suggested as an interesting problem to investigate.

Natural occurrence of eosinophilias, S. HADWEN (*Jour. Parasitology*, 4 (1918), No. 3, pp. 135-137).—The author finds that the hypodermic injection of a susceptible animal with juices extracted from ox warbles results in the formation of a blister-like spot which is followed by a necrotic area. "Smears made from the swelling some hours later, reveal the presence of an eosinophilia, and if the material which was injected contained bacteria, phagocytosis by the eosinophils. . . . The reason for the eosinophils assuming the rôle which is usually assigned to the neutrophils is apparently because the bacteria are rendered attractive by their being bathed in the verminous juices."

The pathology of the skin lesions produced by mustard gas (dichlorethylsulphid), A. S. WARTHIN and C. V. WELLER (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 8, pp. 447-479, figs. 36; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 25, pp. 1947, 1948).—Studies are reported of the gross and microscopic pathology of the cutaneous lesions produced in man and animals by the direct application of mustard gas. Descriptions, with accompanying illustrations, are given of the lesions caused by the mustard gas in man, rabbits, and guinea pigs.

The lesion is a chemical burn unlike that produced by heat, electricity, or the ordinary corrosives. It differs from a heat burn in the absence of thrombosis, in the greater degree of fluid exudation, and in the fact that necrosis requires hours, or even days, for its complete development. In man there is no deep edema, but early formation of vesicles, and in animals there is intense and deep edema with no vesicle formation. In none of the animals under examination was there any conjunctivitis or irritation of the respiratory tract produced by the cutaneous applications, indicating that the conjunctival and respiratory lesions are due solely to the direct action of the vapor.

Contrary to the statement of English and French observers, the authors found that the lesion is greatly reduced in intensity if the oil is immediately washed away. Washing within two minutes with tincture of green soap may entirely prevent the lesion.

Investigations on the composition of oil of chenopodium and the anthelmintic value of some of its components, M. C. HALL and H. C. HAMILTON (*Jour. Pharmacol. and Expt. Ther.*, 11 (1918), No. 3, pp. 231-261).—"The experiments, here noted, appear to warrant the following conclusions:

"Oil of chenopodium as ordinarily marketed is a very potent and valuable anthelmintic, but it not infrequently acts as a gastrointestinal irritant, a fact that seems to have been commonly overlooked, disregarded, or allowed to go unstated, although noted years ago by Brüning and of late years by Salant and Nelson. The gastrointestinal irritation seems to be due to constituents

making up a fourth, or less, of the volume of the oil and constituting the undistilled fraction when the lighter boiling constituents are distilled over at temperatures up to 125° C. with a pressure equal to 30 mm. of mercury, or at equivalent temperatures and pressures.

"The use of the lighter fraction as an anthelmintic in preference to the entire oil, in order to protect the patient from gastrointestinal irritation, is apparently indicated. It will be of considerable interest to obtain clinical data in regard to the therapeutic value of this light fraction, for if our findings are confirmed, the use of the refined product would be distinctly indicated, in spite of the extra expense due to distillation and to discarding part of the oil, as the protection of the patient in the administration of anthelmintics constitutes as large a part of the physician's task as the securing of worm removal. Prolonged experience with potent anthelmintics inclines one to attach adequate importance to the dangers associated with these drugs.

"Schimmel and Company stated, without giving any reasons or proof for the statement, that ascaridol, which apparently corresponds to the heavier fraction of oil of chenopodium, is the part responsible for the therapeutic activity of the drug, a statement which has been generally accepted. Our experiments indicate that this constituent is anthelmintic and also a gastrointestinal irritant, while the lighter portion of the oil is apparently even more anthelmintic and much less irritating. It is also worthy of note, in this connection, that Salant and Nelson found ascaridol 30 per cent more toxic than oil of chenopodium, an additional reason for using the lighter fraction of the oil."

Toxicity of certain widely used antiseptics, H. D. TAYLOR and J. H. AUSTIN (*Jour. Expt. Med.*, 27 (1918), No. 5, pp. 635-646).—The toxicity of various antiseptics was investigated by injecting increasing doses into mice intraperitoneally and into guinea pigs both subcutaneously and intraperitoneally.

It was found that the method of testing the toxicity of antiseptics by subcutaneous injection was not satisfactory, because exudation reduces the rate of absorption and makes uncertain the amount finally absorbed. The substances injected intraperitoneally arranged in order of their decreasing toxicity were eucalyptol and brilliant green; mercuraphen; mercuric chlorid and chloramin T; dichloramin T and proflavine; hychlorite, Dakin's hypochlorite, Javelle water, and magnesium hypochlorite; and iodine and phenol. The authors consider it inadvisable to use any of these antiseptics in closed cavities.

Field investigations of forage poisoning in cattle and horses, H. P. RUSK and H. S. GRINDLEY (*Illinois Sta. Bul.* 210 (1918), pp. 163-176, figs. 4).—The first part of this bulletin deals with feeding tests of corn silage suspected of causing forage poisoning in cattle. Attempts to reproduce forage poisoning experimentally in cattle by feeding suspected or contaminated feeds have been unsuccessful. The results seem to indicate that most cattle are not so susceptible to forage poisoning as are horses and mules and that contaminated corn silage and possibly other animal feeds which are unsafe or fatal to horses may be fed with less danger to cattle. Evidence from many outbreaks leads the authors to suggest that some cattle may be more susceptible than others and that damaged or otherwise contaminated corn silage and possibly other feeds may in some instances produce fatal results in cattle following ingestion.

The second part of this bulletin consists of a report of forage poisoning investigations with horses at Ottawa, Ill., a preliminary discussion of which by Graham has been previously noted (*E. S. R.*, 39, p. 387). Contaminated corn silage from a silo near Ottawa induced a fatal type of forage poisoning in horses following ingestion. The most obvious and characteristic symptoms exhibited were paralysis of the throat, profuse salivation, and lack of muscular coordination. Three steers, a cow, and two calves were fed experimentally for several

weeks on a ration composed exclusively of this silage and water without producing any noticeable symptoms of forage poisoning.

Prophylactic doses of *Botulinus* antitoxin and related immune sera, developed by Graham, Brueckner, and Pontius at the Kentucky Experiment Station protected experimental horses against the effect of the daily ingestion of the contaminated corn silage responsible for the Ottawa outbreak. The results of the tests apparently justify a trial of these sera in cases of similar outbreaks.

Notes on larkspur eradication on stock ranges, C. D. MARSH and A. B. CLAWSON (*U. S. Dept. Agr., Bur. Anim. Indus., 1918, pp. 5*).—It is pointed out that there are three ways in which the continued losses to cattle from larkspur upon the range may be reduced, namely, by the use of the medicinal remedy, by herding the animals away from the plants during the time when they are most poisonous, and by destroying the plant. As indicated in the publication previously noted (*E. S. R., 38, p. 82*) the main reliance must be upon the second and third methods, inasmuch as many cases of poisoning occur when the remedy can not be applied because the stockman is not on hand at the right time.

Attempted eradication of larkspur from stock ranges in the West in some cases has not given as successful results as it might have because the roots were not cut at the depth necessary to stop further growth. Experimental cutting of *Delphinium barbeyi* followed by observations of the effect a year later shows that to insure results the roots should be cut at least from 6 to 8 in. below the surface. "Observations upon two other species, *D. cucullatum* and *D. geraniifolium*, show that in them also the cutting should be at least from 6 to 8 in. below the surface. Certain of the high larkspurs have shallow roots, so that many of the plants can be pulled up." It is pointed out that the best time to dig the larkspur is at about the period of blossoming, for earlier all the shoots of the year will not have developed.

On the life history of *Ascaris lumbricoides*, F. H. STEWART (*Parasitology, 10 (1918), No. 2, pp. 197-205*).—In continuation of investigations previously noted (*E. S. R., 39, p. 286*), experiments are reported which show that ripe eggs of *A. suilla* hatch in the intestine of the pig. The larvæ issuing from these eggs enter the body of the pig and pursue the same course through the body as in the rat and mouse, having been found in the lung from the sixth to the eighth day and in the trachea on the eighth day. Dead larvæ were found in the feces of the pig on the eleventh day after infection.

In experiments in which six pigs were fed *Ascaris* eggs five*proved negative and one possibly positive. Experiments are also reported on the infection of pigs with the larvæ from mice and on obtaining *Ascaris* larvæ in the cecum of the mouse, together with notes on the anatomy of the larvæ of *A. suilla* from the pig, the economic importance of ascariasis in pigs, importance of ascariasis in man, and on the development of the eggs of *A. lumbricoides* in human feces, in the feces of the pig, in contaminated and uncontaminated water, and on the surface of the soil.

Blackleg and hemorrhagic septicemia, C. A. CARY (*Ann. Rpt. State Vet. Ala., 11 (1917), pp. 15, 16*).—The occurrence, modes of infection, symptoms, lesions, and treatment of blackleg and hemorrhagic septicemia are discussed.

Differentiation of the paratyphoid enteritidis group.—IV, The behavior of *B. paratyphosus* A and *B. paratyphosus* B in milk, E. O. JORDAN (*Jour. Infect. Diseases, 22 (1918), No. 5, pp. 511-514*).—In this paper, which is in continuation of the article previously noted (*E. S. R., 39, p. 188*), the author deals with the paratyphoid types in milk.

Studies on the paratyphoid enteritidis group.—V, The correlation of cultural and agglutination results, with special reference to *Bacillus paratyphosus* B and *B. cholerae suis*, C. KREUMWIEDE, JR., L. A. KOHN, and EUGENIA

our. Med. Research, 38 (1918), No. 1, pp. 89-125).—The studies re-fifth contribution are summarized as follows:

nchy to variations, as well as the differences in avidity for car-nown by otherwise similar types has led to contradictory opinions ssifying significance of the cultural reactions of members of the nteritidis group. By correlating the fermentative results, espe-tion to quantitative reductional differences, well-defined groups wn in the tables presented. This grouping correlates host origin tive differences.

: *suis* and *B. paratyphosus* B in this way are separable one from l the cultural differences are paralleled by agglutinin and absorp-*ra suis* is therefore a distinct type, and most of the strains studied milar, and constitute a definite subgroup. This indicates that *suis* B is essentially a human pathogen; that paratyphoid fever, pe, is normally caused by the transfer of the bacillus from man hat infected swine are not a source of contagion for this disease, r or indirectly, through the consumption of infected food."

the occurrence of Negri bodies, J. W. CORNWALL (*Indian Jour. h*, 5 (1918), No. 3, pp. 478-480).—Based upon experiments con-Pasteur Institute of Southern India, it appears "that numerous gri bodies invariably occur after (a) subdural inoculation with rain matter, and (b) subcutaneous inoculation with street virus l matter, when the latter has proved virulent; that scattered and bodies may sometimes be found after numerous subdural passages e same species; that scattered, but fairly large, Negri bodies may found if the fixed virus of one species be subdurally inoculated species; that after subcutaneous inoculations of street virus brain arge and numerous Negri bodies seldom occur, (b) small and gri bodies often occur, and (c) often no Negri bodies at all can be hat after subcutaneous inoculations of fixed virus brain matter, bodies may sometimes be found."

ether on rabic virus, P. REMLINGER (*Compt. Rend. Acad. Sci. (1918)*, No. 18, pp. 750, 751).—Experimental evidence is given that ay be rendered avirulent by the action of ether. This virus when nder the skin of dogs is said to confer lasting immunity. The sts the utilization of this fact in the development of a simple e preventive treatment of rabies in man and animals.

pecies of spirochete isolated from a case of rat-bite fever in Bom- (*Indian Jour. Med. Research*, 5 (1917), No. 2, pp. 386-393, pls. 2, e rat-bite fever of the patient under consideration was caused by on of a specific spirochete by the bite of the rat which had prob-alized spirochetosis. The incubation period of rat-bite fever in the same as in experimental mice, 6 to 10 days, 10 days in the pres- e spirochete recovered from the human lesion is quite different from described, being from 2 to 3 μ in length and showing only two or ee curls. This spirochete is communicable and pathogenic to mice ich, when infected, show a latent period of 6 to 10 days. The se rodents continues several weeks.

spirochetosis in man is like syphilis, viz, localized at the seat of o begin with, then becoming generalized after a definite period of ad lastly, manifesting itself in the cutaneous lesions from which it ad; while the spirochetosis in the mouse is like the relapsing fever t generalized septicemia, the spirochete being recoverable from the

blood stream, the disease being, however, of several weeks duration without relapses.

"Before the demonstration of the virus in the papules, the typical paroxysms of the fever with crises and relapses suggested a spirochetal infection clinically, and the subsequent demonstration of the spirochetes in the lesions confirmed the diagnosis. The complete cure after the injection of neosalvarsan and the rapid disappearance of the eruption (on the third day after the injection) is further evidence of the spirochetal cause of the symptoms in the case under consideration."

Demonstration of micrococci in the bones in rickets and scurvy, LEILA JACKSON (*Jour. Infect. Diseases*, 22 (1918), No. 5, pp. 457-461).—In summarizing the study here reported the author states that while it can not yet be positively stated that "the lesions described are due directly to the action of the micrococci so frequently found in connection with the lesions, and particularly the fresh ones, the presence of cocci appears at least significant. Even should we subsequently decide that these organisms are but secondary invaders, it still seems that the evidence presented by microscopic preparations of the lesions argues for the presence of some infectious agent, and emphasizes the need of further work on the bacteriology of these conditions."

The X-ray appearances of trichiniasis, C. GOULDESBOUGH (*Lancet [London]*, 1918, I, No. 13, p. 468, fig. 1).—The history and X-ray appearance of a case of trichiniasis are reported upon.

Contagious abortion of cattle, W. L. WILLIAMS (*Cornell Reading Course for the Farm*, No. 131 (1917), pp. 163-184, figs. 3).—This is a manual of instruction in regard to contagious abortion, including the effects of the disease, its prevalence, methods of control, and precautionary measures. The problem of growing strong calves is discussed. The use of scours serum is advised for calves in a herd where abortion is common.

Johne's disease, A. L. SHEATHER (*Agr. Jour. India*, 13 (1918), No. 1, pp. 23-31, pls. 2).—The recent discovery of the occurrence of Johne's disease in India has led to the preparation of this summary of information.

Worm nodules in cattle (*Advisory Council Sci. and Indus., Aust., Bul.* 2 (1917), pp. 31).—Five papers are presented in this bulletin, namely, Report of a Special Committee Appointed to Inquire into the Nodule Disease in Cattle and to Make Recommendations as to a Future Plan of Research, by S. Dodd and others (pp. 5-15); The Occurrence of Onchocerciasis in Cattle and Associated Animals in Countries Other Than Australia, by Georgina Sweet (pp. 16, 17), an abstract of the paper previously noted (*E. S. R.*, 34, p. 582); Bovine Onchocerciasis in South America, by Piettre (p. 18), a translation of the paper previously noted (*E. S. R.*, 37, p. 80); Further Investigations into the Etiology of Worm Nests in Cattle Due to *Onchocerca gibsoni*, III, by J. B. Cleland, S. Dodd, and J. F. McEachran (pp. 19-29), the second part of which has been previously noted (*E. S. R.*, 37, p. 181); and Investigations into the Cause of Onchocerciasis in Cattle Conducted in the Northern Territory, by G. Hill, J. F. McEachran, and C. G. Dickinson (pp. 30, 31), a summary of a paper previously noted (*E. S. R.*, 38, p. 82).

Common diseases of swine, H. A. GREER (*Amer. Jour. Vet. Med.*, 13 (1918), No. 7, pp. 317-320).—This paper discusses the differential diagnosis of some of the more common diseases of swine, particularly those which may be confused with cholera and whose presence may explain unsatisfactory results in the use of the serum treatment. The diseases are considered under two aspects, first, when existing independent of cholera but sometimes mistaken for it, and, second, when present as a complication of hog cholera. The disease discussed in greatest detail is necrobacillosis in its different manifestations.

Action of salvarsan on swine erysipelas bacilli in vivo, K. BIERBAUM (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 26 (1917), p. 325; *abs. in Rev. Bact.*, 7 (1917), No. 5-6, p. 152).—In the experiments reported salvarsan and neo-salvarsan had a definite specific curative action on white mice infected with swine erysipelas bacilli. Contrary to statements of some observers, this curative action resulted when fully virulent bacilli were used and not merely in infections with avirulent or only slightly virulent organisms.

Swine erysipelas in man, N. SMITH (*Ugeskr. Læger*, 80 (1918), No. 4, p. 127; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 16, p. 1200).—The author reports having observed six cases of this disease, all in men who had recently slaughtered infected hogs.

Necrobacillosis in swine, R. GRAHAM (*Illinois Sta. Circ.* 222 (1918), pp. 12, figs. 7).—This circular contains a general description of necrobacillosis in swine from the point of view of occurrence, susceptibility, course, and symptoms, and detailed descriptions of the four common types of necrobacillosis—necrotic stomatitis or infectious sore mouth, necrotic rhinitis or bull nose, necrotic enteritis, and necrotic dermatitis. Suggestions are given for the treatment and prevention of the disease.

Necrobacillosis and its relation to hog cholera, B. B. BOWEN (*Amer. Jour. Vet. Med.*, 13 (1918), No. 7, pp. 329-331, 352).—This article deals with the general and special pathology of the diseases caused by *Bacillus necrophorus* and the relations existing between necrobacillosis and hog cholera.

Lesions in spavin and their significance, S. A. GOLDBERG (*Cornell Vet.*, 8 (1918), No. 2, pp. 107-119).—The author's study of cases here reported upon led him to consider the following conclusions justifiable:

"There are very commonly found in horses and cattle low-grade polyarticular inflammations, leading to erosions and ankylosis. In these cases the hock joints are the ones most often affected by these inflammations. It is advisable to have the term spavin indicate any inflammation of the hock joint leading to ankylosis. The origin of spavin may be in the joint proper as well as in the subchondral bone. In many cases spavin is apparently caused by infection. The primary seat of erosions and ankylosis may be in any of the intertarsal as well as the tarso-metatarsal joints. The so-called 'synovial fossæ' are pathological erosions. The so-called 'synovial villi' are, in many cases at least, pathological outgrowths caused by mild irritation. The so-called 'lime points' in the articular cartilages are areas of necrosis in which calcification has taken place. A periarticular ankylosis is, in some cases at least, due to an ossifying inflammation of the capsular ligament. In the cases studied osteoclasts do not play an important rôle in the rarefying otitis."

Generalized sarcomatosis of the fowl, B. F. KAUPP (*Vet. Jour.*, 74 (1918), No. 513, pp. 80-85, figs. 6).—Of 730 autopsies held at the North Carolina Experiment Station upon hens and cocks ranging in age from 12 months to 3 years, 8 were found affected with generalized sarcomatosis. Round-celled sarcoma was the most prevalent type, and round-celled lympho-sarcoma was frequently observed.

RURAL ENGINEERING.

Irrigation by means of underground porous pipe, E. B. HOUSE (*Colorado Sta. Bul.* 240 (1918), pp. 3-15, figs. 9).—Results are reported as obtained with a subirrigation system installed on the college farm in 1913. An old apple orchard of about one-third acre, an alfalfa field one year old of 0.7 acre, and a plowed tract of 1.6 acres subsequently planted to barley and potatoes in 1913, wheat in 1914, and corn in 1915 and 1916, were utilized. The cost of

installation was at the rate of \$218.18 per acre. The conclusions drawn from the experiment are as follows:

"Subirrigation by means of underground pipe is not to be recommended for any of the ordinary farm crops on account of the excessive cost for installation. It can be recommended only for the most intensive farming where water is very scarce and valuable, and only a small stream is available.

"The lateral percolation of the water from the tile lines in deep silt-loam soil is not sufficient to warrant these lines being placed from 16 to 25 ft. apart. More water percolates downward than upward or to the side, and it would be necessary to place these tile lines not more than 8 ft. apart in order to bring the moisture to the roots of the growing crop. This applies to soil similar to that on the subirrigated field at the college farm only. It may be, and probably is, a fact that with a hard-pan or an impervious stratum of some kind slightly below the tile, and especially in early or porous soils, the lateral percolation of the water would be increased very much and the success of a system, with the lines as far apart as 16 or 25 ft., could be guaranteed, but in deep silt-loam soil the lateral percolation of the water is disappointing.

"With deep-rooted crops, such as alfalfa, or with orchards this form of irrigation may be practiced with success as far as lateral percolation is concerned, but the cost of installation is so great that it can not be recommended.

"There has been no clogging of the lines due to the entrance of roots for the four years that the system has been in service.

"The water used for this system was drain water which contained some alkali, but it was evidently not sufficient to cause disintegration of the tile lines as no trouble on this score was encountered.

"A very small stream of water can be successfully used with a subirrigation system of this kind. A stream that would not answer at all for surface irrigation might be more than ample to supply a pipe system for subirrigation on a much larger area."

Efficiency in citrus irrigation, F. M. EATON (*Chula Vista, Cal.: The San Diego Land Corporation* [1918], pp. 16, figs. 10).—In this paper, read before the synopsis club at Riverside, Cal., the author discusses the need for greater efficiency in citrus irrigation and presents a brief analysis of some of the factors deemed of especial importance to proper irrigation, with particular reference to conditions prevailing in the Chula Vista district of California.

Typical specifications for bituminous road materials, P. HUBBARD and C. S. REEVE (*U. S. Dept. Agr. Bul. 691* (1918), pp. 60, figs. 8).—Specifications worked out by the Office of Public Roads and Rural Engineering, conforming in general form to the recommendation of the first conference of State highway testing engineers and chemists, previously noted (*E. S. R.*, 38, p. 87), are presented, being grouped according to type of material. The methods of test and directions for sampling are appended.

Tractor experience in Illinois, A. P. YERKES and L. M. CHURCH (*U. S. Dept. Agr., Farmers' Bul. 963* (1918), pp. 29, fig. 1).—This is essentially a revision of *Farmers' Bulletin* 719 (*E. S. R.*, 35, p. 292), based on detailed reports received from more than 200 tractor owners in Illinois during the summer of 1917 and from 284 in the spring of 1918.

The approximate total cost reported for plowing an acre with a tractor under prewar conditions is summarized in the table following.

Approximate cost of plowing an acre with 2-, 3-, and 4-plow tractors, based on average cost of \$800, \$1,100, and \$1,400, respectively, and a life of 7½ years of 45 working days per year.

Size of tractor.	Total. ¹		Fuel.		Oil.	Grease.	Re-pairs.	De-precia-tion.	Man-labor.	Inter-est.
	Gas-o-line tractor.	Kero-sene tractor.	Gas-o-line.	Kero-sene.						
2-plow	\$1.58½	\$1.33½	\$0.50	\$0.25	\$0.05½	\$0.02	\$0.11	\$0.36	\$0.46	\$0.08
3-plow	1.47½	1.22½	.50	.25	.05½	.02	.11	.37	.34	.08
4-plow	1.50½	1.25½	.50	.25	.05½	.02	.12	.42	.30	.09

¹ The cost of housing the outfit and other minor overhead charges, such as taxes, insurance, etc., are not included.

In the opinion of the men reporting the minimum number of acres in the corn belt on which 2-, 3-, and 4-plow outfits may be expected to prove profitable are 130, 170, and 210 acres, respectively. More than 50 per cent of the tractor owners reported that the quality of work done by the tractor is better than that done by horses, while less than 3 per cent regarded it as poorer.

As to reliability, "the reports of tractor owners indicate that with a careful and proficient operator a gas tractor is a very dependable source of power. Occasional slight delays probably will be encountered, but serious ones will be exceptional, whereas with a careless or incompetent operator expensive delays are apt to be frequent."

Less displacement of horses than is commonly expected was reported. The greatest advantage of the tractor has been "in the fact that it does the heavy work quickly and thus completes it within the proper season, since it places at the farmer's command a large amount of unfiring power when needed."

RURAL ECONOMICS.

Agriculture and the land, G. F. BOSWORTH (*Cambridge, England: University Press, 1917, pp. [VII]+93, pl. 1, figs. 28*).—This book covers not only the field of agriculture but treats of garden cities, water supply, and internal communications. Among the topics treated are the history and development of British agriculture; the effect of climate; the crops and live stock; cooperative organizations; immigration; and working wages, capital, and labor as they relate to farming.

The farm and the nation, J. PORTER (*High Town, Hereford, England: Juke-man & Carver, 1918, pp. 32*).—Among the topics discussed in this pamphlet are foreign competition, national agricultural loss, waste of food, manure, energy, and capital by the present system of farming, the economical distribution of agricultural products, a national system of cheese factories, milk depots, meat collection and distribution, fruit preservation, and granaries, and the possibility of county food exchanges.

Work of the Office of Farm Management relating to land classification and land tenure, W. J. SPILLMAN (*Amer. Econ. Rev., 8 (1918), No. 1, Sup., pp. 65-71*).—The author describes the cooperation of the Office of Farm Management of the U. S. Department of Agriculture with the Bureau of the Census in determining a proper classification of farm lands and the work of the office in studying the proportion of farm land in crops, pasture, and timber, how the farmers acquire their status, and the problem of tenancy and ranch economics.

The utilization of land not in farms, B. H. HIBBARD (*Amer. Econ. Rev., 8 (1918), No. 1, Sup., pp. 55-64*).—The author discusses the public lands remain-

ing in this country, the use of the public domain, and privately owned lands not in farms. He points out that wherever a given amount of labor or capital will immediately produce more on wild land than is being now produced by such labor and capital there is a clear gain in developing the new land. However, the cry for more labor on the farm land now operated is hardly in accord with the demand for the preparation of new fields on which an additional expenditure of labor and capital is demanded before cultivation or other utilization may be begun. Rather we need more fertilizer, more machinery, and all the labor available on the farms as they are.

Government aid and direction in land settlement, E. MEAD (*Amer. Econ. Rev.*, 8 (1918), No. 1, Sup., pp. 72-98).—The author criticizes the land settlement policy of the United States and makes comparisons with conditions in Australia. He also describes, briefly, the system of land settlement being introduced into California.

Farm management surveys (*Agr. Gaz. Canada*, 5 (1918), No. 5, pp. 489-491).—This is a summary of a survey of 113 farms in the Township of Caledon, Peel County, Ontario. The author has summarized his findings as follows:

(1) The size of the business on the small farm engaged in general mixed farming is too small to pay all expenses and leave more than a very small labor income for the operator; (2) High profits from live stock have a greater influence on the labor income than have high crop yields; (3) The quality of the live stock determines the amount of feed which may be fed profitably, since heavy feeding to stock of low quality means a loss rather than a gain. In order that the crops grown may be fed upon the farm to keep up the soil fertility, and at the same time yield a profit, the quality of the stock on a great many farms must be improved.

The Chicago milk inquiry, C. S. DUNCAN (*Jour. Polit. Econ.*, 26 (1918), No. 4, pp. 321-346).—Among the conclusions drawn by the author from a study of this inquiry is that dairymen who own farms have a ready alternative use of their crops as grain or live stock if they are not assured as much profit in dairying. In other words, they expect to run their farms on a commercial basis, doing with them what pays best. The investigation thus shows the great difficulty in attempting to set the price of a finished product while leaving uncontrolled the materials from which it is produced, and which have other uses.

A study of marketing conditions in the Salt River Valley, Ariz., J. H. COLLINS (*Arizona Sta. Bul.* 85 (1918), pp. 3-69, figs. 6).—This is a study of the conditions of marketing various agricultural products of Salt River Valley during the crop season of 1917, made in cooperation with the U. S. Department of Agriculture.

The author concludes that a participation of the Salt River Valley Water Users' Association in the marketing problem is eminently desirable from the viewpoint of the producer. The study indicates that the present inability of growers to supply dependable quantities to buyers who desire to negotiate for such products year after year may be overcome by stabilizing cropping plans, and that the question of better grades and standards and plans for the consolidation of products for shipping may be solved by a more complete cooperative action on the part of the farmers.

Plan of the Department of Agriculture for handling the farm-labor problem, E. V. WILCOX (*Amer. Econ. Rev.*, 8 (1918), No. 1, Sup., pp. 158-170).—The author describes the organization of the Office of Farm Management and the U. S. Department of Labor with reference to the farm-labor problem and the methods used by the farmer to ascertain the farm-labor shortage and to distribute labor. He also calls attention to various sources of farm labor that

may be developed and to the effects of the compulsory-work laws in developing a supply.

The labor situation for fruit farmers, MISS HARVEY (*Ann. Rpt. Fruit Growers' Assoc., Ontario*, 49 (1917), pp. 59-65).—The author gives a brief description of the efforts to use woman labor in connection with gathering of fruit in the Province of Ontario, Canada.

Agricultural banking in the Delta of Burma, L. DAWSON (*Agr. Jour. India*, 13 (1918), No. 1, pp. 71-81).—The author has discussed the conditions under which the agricultural industry is at present financed, the measures adopted by the Government for affording financial assistance to the farmers, and proposals for better financing in the future.

Land and Agricultural Bank of South Africa (*Union So. Africa, Land and Agr. Bank So. Africa, Rpt. 1917*, pp. 52).—This report contains a description of the general type and condition of farming where the local banks are located and the extent of the business of the individual organizations within the Union.

Cooperative farm implement societies, T. WIBBERLEY (*Jour. Bd. Agr. [London]*, 22 (1915), Nos. 5, pp. 413-417; 6, 570-573, pl. 1; 23 (1916), No. 1, pp. 52-58, pl. 1, fig. 1).—A brief description is given of the workings of the Irish cooperative farm implement societies.

In these societies implements are usually hired out in the order in which applications for them are made by the members, except that since the main object is to encourage tillage precedence is given to the member who wishes to use the implement for the longest period. In a well-conducted society it has been found that the cooperatively owned implements can earn sufficient returns to pay for their initial cost and contribute toward the purchase of additional implements.

A discussion is also given of the operation and management of cultivating implements, thrashing machines, and motors.

County organization for rural fire control, W. METCALF (*California Sta. Circ. 202* (1918), pp. 23, figs. 5).—This circular discusses in detail six items deemed essential for an adequate fire-protection plan for a county: A county fire warden; local fire companies, each with competent officers and a district fire plan; installation of adequate fire-fighting equipment; a comprehensive county fire ordinance; publicity measures throughout the county and in each local district; and prompt reports on all fires. It concludes with a list of the California counties, showing the organizations cooperating in fire protection, sample forms for reports, and the text of the fire ordinance of Stanislaus County.

Farm household accounts, W. C. FUNK (*U. S. Dept. Agr., Farmers' Bul. 964* (1918), pp. 11, figs. 6).—Methods for adapting household accounting systems to the farm household, making special allowance for supplies provided by the home farm are discussed.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt.*, 4 (1918), No. 7, pp. 69-84, fig. 1).—This number contains the usual data with reference to acreage and condition of the principal crops on July 1, 1918, with comparisons; average prices received by producers of the United States; range of prices of agricultural products at important markets; and the estimated farm value of important products June 15 and July 1. There are also reports on kafirs, beans, broom corn, hops, cotton, pecans, peaches, early apple production, area of sugar beets planted, winter wheat planted compared with harvest acreage, standards for shelled corn, revised wheat prices, field beans, acreage estimates; Florida and California crops, general crop conditions by States, commercial cherry crop, commercial acreage of watermelons and cantaloups, honey yields and prospects,

tobacco estimates by types and districts, world's raw silk production, cabbage for kraut, etc., and special articles comparing crop production and railroad tonnage, and giving data as to the production per man and per acre for different countries.

Acreage and live stock returns of England and Wales (*Bd. Agr. and Fisheries* [London], *Agr. Statis.*, 52 (1917), No. 1. pp. 36).—This report continues the information previously noted (E. S. R., 36, p. 690) by adding data for 1917.

Estimates of area and yield of principal crops in India, 1915-16 (*Dept. Statis. India, Est. Area and Yield Princ. Crops India, 1915-16*, pp. [5]+27).—This report continues information previously noted (E. S. R., 35, p. 91), adding data for 1915-16.

[Agriculture in Japan] (*Statis. Rpt. Dept. Agr. and Com. Japan, 33* [1916], pp. 1-133).—These pages continue the statistical data previously noted (E. S. R., 37, p. 492).

AGRICULTURAL EDUCATION.

Vocational teachers for secondary schools: What the land-grant colleges are doing to prepare them, C. D. JARVIS (*U. S. Bur. Ed. Bul.*, 38 (1917), pp. 85).—This is an account of what the land-grant colleges are doing to prepare teachers of agriculture, home economics, and trades and industries for the secondary schools, discussed under the uniform heads for each institution of its nature and scope, requirements for registration, students, and instructors. Concluding each account a brief statement is made of the institution's powers and influences concerning certification.

Of the 48 institutions teaching agriculture, 40 now offer a special 4-year collegiate curriculum for the training of teachers, including at least a 2-hour course in special methods of teaching agriculture and one 3-hour course in either psychology or education. Much variation in methods is shown, especially in the State universities where a part of the curriculum is offered by the college of agriculture and a part by the school or department of education.

As regards the nature and scope of teacher-training work in agriculture, some institutions offer a special curriculum quite different from the regular agricultural curriculum. Others require the regular agricultural curriculum and the election of agricultural education as the major option. Some require the regular curriculum with a major option in some one phase of agriculture and the necessary educational courses as electives. In some the regular agricultural curriculum includes all or part of the educational work required for certification. In others a 4-year curriculum in education is offered with opportunity for majoring in agriculture or any other subject or subjects that the candidate expects to teach. It is held that in general the same results are accomplished in each case, but there seems to be a divergence of opinion as to whether students who are preparing to teach should be given general instruction in agriculture or specialized instruction in some phase of agriculture.

A great variation is found in the proportion of time devoted to the various classes of subjects and in the total amount of work required. As regards frequency of occurrence of subjects in educational courses, it is shown that of a total of 637 courses offered, aggregating 1,767 semester hours, 39 courses, aggregating 110 semester hours, are offered in agricultural education, and 22 courses, aggregating 67 hours, are offered in rural education.

Twenty-nine institutions require practice teaching, which is provided for in many cases by special high schools for the purpose and through cooperation with the local schools. Of the 40 institutions offering teacher-training curricula in agriculture, 38 require for admission at least 14 units of high-school work.

Thirty-two of the institutions require at least two years of collegiate work before registration for psychology and educational courses will be permitted. Practical farm experience is seldom a requirement for admission to the freshman class. A few institutions require a certain amount before entrance to the junior year. Sixteen institutions require some practical farm experience before graduation, the amount varying from six weeks to one year of recent experience obtained, as a rule, either on the student's home farm or an approved farm.

In 34 institutions reporting, 841 men and 18 women were registered in 1916-17 for training in agricultural education, including all those who had actually declared their intention of preparing to teach. From 35 institutions reporting, 513 students graduated with professional training in agricultural education in 1916. Of these 299 are known to be engaged in the teaching or supervision of agriculture in the schools. Twenty-six institutions report that a total of 112 graduates in 1916 from their regular agricultural curricula are also known to be teaching or supervising agriculture in the schools.

Thirty-three of the land-grant agricultural institutions offer 4-year curricula for the preparation of teachers of home economics. Most of these curricula provide sufficient elective work for students to carry enough in education to meet the requirements for certification. While in many of these institutions home economics has been associated with agriculture, and even in the State universities is frequently constituted a department or division of the college of agriculture, the tendency at the present time is toward segregation, with a view to establishing home economics as a major division of the college or university. In some institutions home economics is organized as a department of the college of arts and science. In Pennsylvania State College it is a department unattached to any of the major divisions, but seems to be organically coordinated with them.

Many of the institutions offer two curricula in home economics, one bearing especially upon domestic science or foods and nutrition and the other upon domestic art or textiles and clothing. They usually offer professional courses in each for those who are preparing to teach. In some cases the curricula are distinct throughout the four years, requiring, however, in the first two years some work in both branches. Sometimes the work in both curricula will be the same for the first two years. About an equal number of institutions, however, still maintain a single curriculum embracing both branches of home economics, there being usually sufficient elective work to enable students to specialize to some extent. Out of 33 institutions reporting, 30 require practice teaching, and opportunity for such work is offered in the others.

All of the institutions offering training courses in home economics require at least 14 units of high-school work for admission to the freshman class. The institutions assume that all students registering for home economics will have had some practical experience in work about the home and therefore do not make this a requirement for admission. Many curricula offer opportunity for independent experience in household management by means of a demonstration cottage.

At the 27 institutions reporting, 1,318 women are now registered for professional training in home-economics education. At 28 institutions reporting, 663 students graduated with professional training in 1916. Of these 487 are known to be engaged in teaching or supervising home economics. Nine 1916 graduates in home economics without professional training are also known to be engaged in school work.

Report of (the) committee on mobilization of high-school boys for farm service (*Boston: Mass. Com. on Pub. Safety, 1917, pp. 60, pl. 1*).—This report outlines the history of the movement in Massachusetts to mobilize high-school boys for farm work, including principles of mobilization, methods of conducting the work, cooperation, and office administration; sites, equipment, and management of camps; an evaluation of the movement; and the relations of the committee with the Boys' Working Reserve. It is recommended that the work begun during the current year be continued in 1918 and that plans be made for 50 camps involving an estimated expenditure of \$50,000 of public rather than private money; that the committee assume the responsibility and control of the supervision of camps through a director assisted by camp supervisors, etc.; that training courses for camp supervisors and cooks be offered; and that camp equipment, supplies, commissary, and business methods be standardized.

The duties of the director should be to carry on the campaign of publicity, to secure cooperation, to make plans for enlistment, to secure placement, etc. Men who have had some previous experience in agriculture, who have some appreciation of the problems of a farmer, men who have had military training or direction of boys in first-class private camps, offer possibilities as camp supervisors. It is suggested that the course of training for camp supervisors include instruction in the routine and care of camps, camp sanitation, recreation and use of leisure time, camp discipline, camp accounting (financial), the selection and care of boys for farm work, and the protection and instruction of boys at work on the farms. Except in cases where close and constant supervision of boys is possible, or where the parent will assume the responsibility for the boy's welfare, sending boys away from home on isolated farms is not recommended. The method of placing boys through camps proved to be the most successful way of taking labor away from the place where there is a large surplus to the place where it is needed. The committee sees much value in preliminary training for boys and a system for physical "hardening up" would be equally advantageous.

The plan adopted by Maine, which, during the season of 1917-18, appropriated from funds at the disposal of the Council of National Defense \$150,000 for the training and placing of boys in farm service, is briefly outlined, together with a statement of public appreciation of Maine's solution for the back-to-the-farm movement for boys in the successful first season of the Junior Volunteers of Maine.

The committee is convinced that given the three essentials of time—that is, early enrollment of boys and arrangements for employment with farmers, of proper supervision, and of cooperation with the local agricultural organizations, the work can be successfully carried on. In the opinion of the committee there is no question as to the value of the service rendered by these boys, and the expense to the State of double or treble the amount (\$4.46 per boy) would be justified by the benefits the boys receive in health and experience without taking into consideration their productive value.

The text of a bulletin of the committee on food production and conservation of the department of mobilization of school boys for farm service, entitled "Plan for Cooperating Schools in Massachusetts," a list of publications of this committee, data on camp inspections and recreational equipment furnished, newspaper articles illustrating methods of local supervision and the cooperative efforts of other public agencies, and a comment on the West Virginia compulsory employment law are appended.

Science for beginners, D. FALL (*Yonkers-on-Hudson, N. Y.: World Book Co., 1917, pp. X+382, figs. 231*).—The chief purpose of this first book in general science for intermediate and high schools, according to the author, is not to

give pupils a large amount of information in the natural sciences but to introduce them to the scientific method through the use of which they will acquire the habit of gaining information for themselves. Among others are chapters on science and the scientific method, what the young scientist must learn to do, the soil, and the potato. Numerous practical exercises are interspersed throughout the book.

An outline for the teaching of agriculture in the seventh and eighth grades, C. COLVIN ([*East. Ill. State*] *Normal School Bul.* 57 (1917), pp. 45).—This bulletin contains a suggestive outline, in monthly sequence, in plants and the soil for the seventh grade, and in animal husbandry for the eighth grade, suggested outlines for home projects, and a list of references to helpful literature.

MISCELLANEOUS.

Thirtieth Annual Report of Louisiana Stations, 1917, W. R. DODSON (*Louisiana Stas. Rpt.* 1917, pp. 24).—This contains the organization list, a financial statement regarding the Federal funds for the fiscal year ended June 30, 1917, and the State funds for the fiscal year ended November 30, 1917, and a report by the director, including brief departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-first Annual Report of Nebraska Station, 1917 (*Nebraska Sta. Rpt.* 1917, pp. LIV).—This contains the organization list, a report of the work of the year, a report of the extension service of the college of agriculture, and a financial statement for the fiscal year ended June 30, 1917.

Monthly Bulletin of the Ohio Agricultural Experiment Station (*Mo. Bul. Ohio Sta.*, 3 (1918), Nos. 6, pp. 168–197, figs. 20; 7, pp. 198–226, figs. 11).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 6.—Stomach Worms and Tapeworms of Sheep, by D. C. Mote; Scaly Leg of Poultry, by D. C. Mote, an extract from Bulletin 320 (E. S. R., 39, p. 85); Spraying for Potato Diseases, an adaptation from Bulletin 319 (E. S. R., 39, p. 53); Spraying for Tomato Diseases, an adaptation from Bulletin 321 (E. S. R., 39, p. 250), and Clover v. Alfalfa, by C. C. Hayden, an abstract of Bulletin 327, noted on page 578.

No. 7.—Wireworms, by J. R. Stear.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 6 (1918), No. 4, pp. 45–60, fig. 1).—This number contains brief articles on the following subjects: Farm Accounts, by R. N. Miller; The Garden in Summer, by J. L. Stahl; Aphid on Farm Crops, by E. B. Stookey; Hill Selection of Potatoes with Reference to Controlling Disease, by A. Frank; Storage of Fruits and Vegetables, by J. L. Stahl; Cost of Raising Cockerels for Broilers, by C. R. Shoup (see p. 577); Moles and Thrift Stamps, by T. H. Scheffer; Warning, by W. A. Linklater; Military Training at the State College, by F. T. Barnard; and Farmer's Excursions to the Station.

NOTES.

Kansas College.—An amendment to the State constitution was adopted at the recent election providing that the legislature may levy a mill or fractional tax to support State educational institutions.

Kentucky University and Station.—The food and drug department has been discontinued, its duties having been absorbed by the State Board of Health, in accordance with a recent act of the legislature. The station continues, however, to perform the analytical and bacteriological work, receiving \$18,000 per annum for that purpose. What was known as the public service laboratories have been organized in the station with J. O. La Bach as director, L. A. Brown special analytical chemist, and W. R. Pinnell special bacteriologist.

The animal husbandry work, including the departments of beef cattle, sheep, and swine, dairy cattle, horses, and poultry, and veterinary science, has been organized in a single group with E. S. Good as chairman.

J. B. Hutson, assistant in farm management, has been granted leave of absence to enter military service. Recent appointments include L. E. Weaver as assistant extension specialist in poultry, effective September 1; Miss Madge Lamareaux as instructor in home economics, effective September 1; and Miss Amanda Harms as assistant in pathogenic bacteriology, effective October 1.

Maryland College and Station.—Recent appointments include E. C. Auchter, assistant professor of horticulture and assistant horticulturist at the West Virginia University and Station, as horticulturist, and Dr. E. M. Pickens as professor of animal pathology and bacteriology.

Massachusetts Station.—Dr. William P. Brooks, agriculturist of the Hatch Station during its entire existence and director of the present station since 1906, has resigned and become consulting agriculturist. F. W. Morse has been appointed acting director of the station.

Stuart C. Vinal, assistant entomologist in the station, died of pneumonia September 26, at the age of 24 years. He was a graduate of the college in 1915 and received the M. S. degree in 1917. He was the discoverer of the European corn-borer (*Pyrausta nubilalis*) in this country and was engaged in a study of its habits when stricken with Spanish influenza.

Dr. B. N. Gates resigned as apiarist October 1. Miss Esther S. Mixer has been appointed assistant chemist, beginning September 1.

New Jersey College and Stations.—Dr. B. D. Halsted, associated with the botanical and horticultural work of the institution since 1889, died August 27, aged 66 years. Dr. Halsted was a graduate of the Michigan College in 1874 and received the degree of Doctor of Science from Harvard University in 1878. He was managing editor of the *American Agriculturist* from 1880 to 1885 and professor of botany in the Iowa College from 1885 to 1889. During his long period of service in New Jersey he became widely known, particularly for his extensive studies of breeding principles carried on with tomatoes, corn, peppers, eggplant, and other plants. He received the silver medal of the Massachusetts Horticultural Society in 1877, and had been an associate editor of the *Flora of North America* since 1905. He was a fellow of the American Association for

the Advancement of Science, president of the Society for the Promotion of Agricultural Science from 1897 to 1899, and of the Botanical Society of America in 1900-01. A large number of articles from his pen have appeared in the station bulletins and reports and in the various scientific journals.

Ohio Station.—M. O. Bugby has resigned as superintendent of the experiment farms in Trumbull and Mahoning Counties, and has been succeeded by J. P. Markley, superintendent of the test farm at Strongsville, to which position W. H. Ruetenik has been appointed. W. J. Smith has resigned as superintendent of the county farms in Clermont and Hamilton Counties, and has been succeeded by H. W. Rogers, foreman of the Madison County farm. Elton Mohn has been appointed assistant in farm management.

Pennsylvania College and Station.—Fred S. Putney, professor of experimental dairy husbandry, died of pneumonia October 5 at the age of 37 years. Professor Putney was a graduate of the New Hampshire College in 1905, received the M. S. degree from the Pennsylvania State College in 1908, and had just completed the requirements for the Ph. D. degree from the University of Wisconsin. He had also served as assistant in animal industry and general experimental work at the Pennsylvania College from 1906 to 1908, as assistant to the dean of the College of Agriculture at the University of Missouri, and as head of the department of animal husbandry of the Rhode Island College. He had been specially interested in teaching and research in animal nutrition, notably dairy cattle feeding problems, and was the author of numerous publications.

H. P. Cooper, instructor in agronomy, resigned September 5. D. E. Haley, assistant professor of agricultural chemistry, and Miss Julia C. Gray, librarian and editor, have been granted leave of absence. J. H. Muncie has been appointed instructor in plant pathology.

Rhode Island College.—O. E. Brett, who has been in charge of the poultry work at the New York State School of Agriculture at Morrisville, has been appointed head of the poultry department. His duties will include both teaching and the supervision of the poultry demonstration projects recently formulated to stimulate poultry and egg production in the State.

Washington College.—R. V. Mitchell, professor of poultry husbandry at the Delaware College, has been appointed head of the poultry husbandry department and director of the all-northwest laying contest.

Wyoming Station.—D. C. Buntin, a large landholder in the Laramie Valley, has given to the agronomy farm the use of about 60 acres of land, together with water rights therefor. This land is to remain the property of the station as long as it is used for experimental purposes.

Miscellaneous.—The patents and copyrights branches have been removed from the Canadian Department of Agriculture and continued in charge of Geo. F. O'Halloron; the former deputy minister of agriculture. Director Joseph H. Grisdale, of the Dominion Experimental Farms, has been appointed acting deputy minister of agriculture.

Two scholarships in agriculture for each State have been established at Notre Dame University by two firms of agricultural implement manufacturers and bankers in different sections of the country.

G. Wery, assistant director of the National Institute of Agronomy of France, has been appointed director, vice Dr. Paul Regnard, retired.

Wade Toole has been appointed professor of animal husbandry and farm superintendent of the Ontario Agricultural College.

The Minister of Agriculture of Holland has brought about the reorganization of the Veterinary College at Utrecht and the Agricultural College at Wageningen whereby these institutions have been made of university rank.

EXPERIMENT STATION RECORD.

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Cooperation, coordination, and effective organization of scientific effort in the interest of advancing knowledge were dominant notes at the Baltimore meeting of the American Association for the Advancement of Science. The attention given the subject in sessions of various sections and affiliated societies, and the emphasis with which it was presented, mark the development of a new attitude in degree if not in kind, which reflects the larger and more liberal view of the relations and responsibilities of men of science.

Conviction as to the desirability of a closer union of effort and confidence in its feasibility have come in no small measure out of the war. The latter with its appeal and with the universal desire of science to serve in the largest possible measure has tended to break through the reserve of the past and to develop a willingness to pool ideas and efforts in the interest of the common good. Competition has given place in considerable degree to cooperation, and concern for personal advantage has been in a degree subordinated. The National Research Council, by example and stimulation, has served to crystallize this readiness for common service, and resulted in the organization of a considerable amount of well-directed cooperative work around definite problems. The movement set in motion for the war bids fair to have a permanent influence, and the impression left at the Baltimore meeting was of a quite widespread conviction that the interests of scientific progress are beyond those of any individual and should be promoted by a community of effort. This broader outlook may have a future bearing on some types of scientific activity in which agriculture is closely interested.

Without attempting a systematic review of the discussion of this subject in various meetings, the extent of which was remarkable, mention may be made of two or three occasions of special prominence.

An interesting symposium on the present duty of botanists, arranged by the Botanical Society of America and the American Phytopathological Society, centered quite largely on the importance and value of cooperative effort and its relation to systematic progress in the science and its applications. Dr. John M. Coulter maintained that every important problem in synthetic, and that the syn-

thetic view recognizes the necessity of cooperation. While fully admitting the value to botanical science of division into its separate branches, and the development of specialists interested primarily in their branches, he pointed to the inability of these separate branches to solve some of the broad problems, which leads to the necessity of joint effort toward a common end. This lends importance to the cultivation of the synthetic attitude of mind, and a less restricted view and interest on the part of specialists.

Prof. H. H. Whetzel reminded his hearers that cooperation and coordination are the very elements of all biological progress, and that while science has discovered and accepted this fact, it has not put it into practice. Both of these speakers pointed to the prevalence of isolation in research, its pursuit from a largely individual standpoint, the laying of much emphasis on priority of discovery, the attempt to develop some dart which might pierce the armor of coworkers, and other evidences of an individualistic attitude. Speaking plainly, the chief obstacles to cooperation were stated to rest in a selfishness of workers, jealousy or distrust of contemporaries, and desire for personal advantage. That cooperation need involve no loss of individual initiative or the subordination of the individual to mere routine activity, was emphasized by these and other speakers, who presented illustrations from recent experiences. That individual, isolated effort does not represent the highest type of efficiency in many cases was shown by some of its effects.

One result of solitary uncorrelated investigation is what was designated as "a débris of data," incomplete in themselves and widely scattered, rather than clear, comprehensive, and conclusive results, competent to settle specific points. Such investigation is scrappy, and its fragmentary contributions have led to a voluminous literature in which the research worker must spend much time burrowing in order to determine just what his predecessors and contemporary workers have established before he is in position to add his contribution. Because of the desire to rush into print to establish claims to priority, considerable of this voluminous literature is not only fragmentary but the results were frankly characterized as immature, a product of working in "solitary confinement," or as another has said of an "unorganized, undirected, scientific spirit."

Under this system of unrelated independent effort, as Dr. Coulter pointed out, progress has been too slow and halting. It has been disjointed and unsystematic. It has not gone on as rapidly as it might have done if there had been some measure of coordinated effort, a working together for a common purpose and to a common end, rather than giving major attention to holding a narrow field as a personal preserve. Sometimes this attitude has gone beyond the individual and been an institutional one. With much earnestness Dr. Coulter

declared that such an attitude breeds emphasis on individual glory, that the purpose of research is not self-glorification but the advancement of knowledge, and that personal and institutional exclusiveness should be submerged in union for a great National service.

In urging the stressing of the practical outlook of science, two of the speakers referred to the maintenance of close contacts with agriculture, which embraces so many of the plant problems related to human welfare. The "disarticulation of botany from its applications" was regretted as most unfortunate for both the science and its applications, and to be remedied by broader interests and contacts.

Several speakers went so far as to outline some of the essentials which should characterize the organization of cooperative effort—the voluntary association of individuals for such effort, the union of the cooperators in a project committee, the choosing of a project leader to guide and sustain rather than direct, conferences at which there should be a pooling of results and ideas, and the self-determination of the method of publication. It was made clear also that successful cooperation requires first of all a definite, specific problem; and a number of such topics were enumerated by different speakers which might with advantage be attacked through cooperative understanding. In this connection Dr. B. E. Livingston announced that a cooperative project on the salt requirements of agricultural plants was being launched under the auspices of the biological division of the National Research Council. Participation was invited in this project, which will be recognized as one having fundamental importance in relation to plant growth and nutrition.

At least two speakers quoted from a recently published criticism by Hon. Elihu Root, on the organization of science for research. In this he pointed out that "science has been arranging, classifying, methodizing, simplifying everything except itself;" that while it has made possible the tremendous modern development of the power of organization which has so multiplied the effective power of human effort, "it has organized itself very imperfectly." As to the need and method of such organization he said: "Occasionally a man appears who has the instinct to reject the negligible. A very great mind goes directly to the decisive fact, the determining symptom, and can afford not to burden itself with a great mass of unimportant facts; but there are few such minds even among those capable of real scientific work. All other minds need to be guided away from the useless and towards the useful. That can be done only by the application of scientific method to science itself through the purely scientific process of organizing effort."

No voice was raised against this criticism or objection that it was not merited, but on the contrary it was quoted to emphasize the

weakness of lack of organization and the importance of measures for securing more coordinated effort in certain types of inquiry.

The subject of the organization of science for research was discussed in a special address by Dr. George E. Hale, dealing with the future plans of the National Research Council. Reference was made to the executive order issued last May providing for the perpetuation of the council, and assigning to it the general purpose of stimulating research and arranging for effective cooperation. The latter is perhaps the most important feature of the perpetuated organization as defined, and is the principal means mentioned by which it is to increase scientific knowledge and its applications.

The council is devised as an agency for suggesting lines of research and rallying investigators around specific inquiries—a medium for promoting cooperation and coordination rather than itself a research institution. Its authorization is “to survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.” The aim is “to promote cooperation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress;” and furthermore, “to gather and collate scientific and technical information, at home and abroad, in cooperation with governmental and other agencies, and to render such information available.”

In presenting this matter to the association, with tentative plans for an organization to carry out the purpose of the order, Dr. Hale invited suggestions and criticisms from the various branches represented in the association, realizing, as he said, that the successful evolution of such an agency must itself be a cooperative constructive undertaking, combining the outlook and the best thought of all the sciences. Under the broad authority granted, this matter may be one of importance to agricultural institutions and agricultural investigation, as agriculture is one of the arts mentioned in the opening paragraph of the executive order. Evidently the attempt “to secure concentration of effort, minimize duplication, and stimulate progress” is as important in that subject as in any branch of applied science, although it is already receiving considerable attention.

Science grows by accretions, but there is little reason to doubt that this growth may be more regular, systematic, and productive of a more substantial product, if the activity of individual workers is in some measure organized and coordinated. Research, at least in its higher phases, is recognized as essentially an individual product, but it need not be less so because it is cooperative or bears a recognized relation to the work of others. That the individual investigator is

to be guarded and stimulated and not subordinated through joining hands with others is clearly recognized in the executive order mentioned above, which stipulates that "in all cooperative undertakings encouragement is to be given to individual initiative, as fundamentally important to the advancement of science." The effort must therefore be to provide a form of assistance which will coordinate rather than subordinate, and direction which will guide rather than dominate.

It is important to develop a means of linking the sciences so that they will be brought to bear on large problems the solution of which lies beyond the realm of any single branch. This class of problems is especially prominent in agriculture. They need the assistance of specialists in different branches and phases of science, and these specialists need to be brought together around the problems. Instead of encouraging a feeling of self-complacency and self-sufficiency within small divisions of science, emphasis needs to be placed on the interdependence of these divisions and their individual limitations in case of many complex problems, and upon the strength of a union which combines the outlook and the method of attack of the different branches involved. Such a union of effort is best accomplished through conferences which analyze and dissect the problems and construct such a cooperative plan as involves the joining of head and hand.

There is much need, as has been said before, of an organization of research on the basis of subjects rather than of sciences or divisions of sciences. This is especially true in our agricultural inquiry where the problem is the unit and may profitably be attacked as such, rather than isolated fragments being studied and reported upon without definite reference to the question as a whole.

The conditions favorable to a union of effort are in some respects combined to an unusual degree in the agricultural experiment stations. Their organization now largely follows the important divisions of the field of agriculture rather than the elementary sciences; they are close to the large practical questions which need determination; and in very many instances they are confronted by similar conditions and are studying questions common to a considerable group of States. But it can hardly be denied that they are a mark for the criticism expressed in Mr. Root's address. They are largely working independently and separately on like general problems, some of which lend themselves to joint effort. They are duplicating experiments on an extensive scale, and often with little knowledge of one another's work or results until such time as they may be published. Because of lack of common plans it is often difficult to harmonize their findings and make the separate experiments supplement one another effec-

tively. Such a system can hardly fail to be wasteful of money and human effort, and prevents a degree of efficiency and a measure of progress in securing needed information which it ought to be possible to improve upon.

It is a question whether this difficulty is not in the last analysis quite largely an administrative one. At all events, improvement may very properly and effectually start from that source. It will involve a more intensive study of the station program in relation to specific problems, the trend and promise of long continued lines of experimental work on a local basis, constructive criticism of plans in operation and their competency to give conclusive results, and attempt to see how results line up with those in adjoining States. It will doubtless require some little administrative attention to overcome the individualistic viewpoint, to rally men around specific problems, and to maintain concentration, but these and the general guidance of the course of the station are chief functions and constitute a form of leadership which is more highly essential than ever before.

The war has interrupted and disturbed the station work, and has led to new duties. The administrative force especially has had exacting and imperative tasks added to its already heavy burden of supervision of the various agricultural enterprises of the colleges. These have left insufficient time at many institutions for the detailed consideration of station affairs. But the period of readjustment which has come is an opportune time for a thorough consideration of plans and future policy for the experiment stations, with adequate provisions for direction and organization of effort.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Industrial and manufacturing chemistry: II, Inorganic, G. MARTIN ET AL. (London: Crosby Lockwood & Son, 1917, vols. 1, pp. XIX+496, pls. 5, figs. 271; 2, pp. XVI+482, figs. 167).—This is a supplement to the treatise on organic industrial chemistry, previously noted (E. S. R., 30, p. 610). It includes both American and British practice in inorganic chemistry, the following sections being among those included: Refrigerating and ice-making machinery, liquefaction of gases, technology of water, artificial mineral waters, sulphur, sulphuric acid and other sulphur compounds, salt, hydrochloric acid, sodium sulphate, sodium carbonate, Stassfurt industry, potassium salts, calcium and magnesium salts, gypsum, barium, and strontium salts, compounds of boron, chlorine, chlorates and perchlorates, bleaching powder and hypochlorites, bromine, iodine, hydrofluoric acid, peroxides and peracids, circulation of nitrogen in nature, nitrates, nitric acid, ammonia and ammonium salts, cyanamid, cyanides and prussiates, nitrous oxide, organic and inorganic disinfectants, antiseptics, insecticides, fungicides, sheep dips, artificial manures, aluminum compounds, artificial zeolite or permutite, calcareous cements, clays and allied materials, glass, enamels, asbestos, mica, rare elements, radioactive substances, etc.

Practical organic and biochemistry, R. H. A. PLIMMER (London and New York: Longmans, Green & Co., 1918, rev. ed., pp. XII+636, pl. 1, figs. 86).—For the new edition of this book, previously noted (E. S. R., 35, p. 8), the text has been thoroughly revised, several sections have been rewritten, and some new methods of preparation and analysis have been incorporated.

Factors affecting the composition of plant ashes, with special reference to tobacco, O. D. ROBERTS (*Analyst*, 43 (1918), No. 508, pp. 254-259).—Tobacco was selected for investigation on account of the influence of the composition of the ash on the burning quality of the tobacco and on account of its relatively large percentage of ash.

It was found that the methods commonly employed in the preparation of plant ash result generally in an ash deficient in carbon dioxide. In order to obtain correct results, it is suggested that the carbon dioxide in such ash should be determined and the mineral constituents calculated on an ash free from unburned carbon.

Analytical data are presented showing that, while part of the inorganic chlorine present in tobacco is lost in the production of the ash, the sulphate content is in excess of that originally present as sulphate in the plant.

"In order to differentiate between those constituents present partly in an organic and partly in an inorganic condition, no reliance can be placed on the ash analysis as giving the amounts originally present as inorganic salts, but these latter must be extracted from the plant by water or dilute acids. The organic chlorine, sulphur, and phosphorus are conveniently obtained by the difference between that inorganically combined and the total present in the plant."

The proteoclastic enzymes of yeast and their relationship to autolysis, K. G. DERNBY (*Abs. in Chem. Abs.*, 11 (1917), No. 20, pp. 2815, 2816).—The author has

demonstrated the presence in yeast of three enzymes which are analogous to, but differ in certain particulars from, the proteolytic enzymes of the animal organism. The enzymes are (1) yeast pepsin, which splits proteins to peptones and for whose action the optimum hydrogen ion concentration is at $\text{PH}=4-4.5$; (2) a yeast tryptase, which does not act on the protein of the yeast but can split certain proteins, such as acid albumin, gelatin, and caseinogen, into peptids and amino acids, and whose optimum action is at $\text{PH}=7$; and (3) a yeast ereptase, which readily splits peptones and polypeptids into amino acids, and which has an optimum action at $\text{PH}=7.8$.

The method employed by the author consisted in following the course of hydrolysis of yeast and other products in media with varying hydrogen ion concentrations, both in the presence and absence of buffer solutions. Determinations were made of the total nitrogen, amino-peptid, and protein nitrogen after varying intervals of autolysis. The action of the various enzymes was also investigated by extracting them from yeast plasmolized by chloroform in the presence of calcium carbonate and dialyzing the extract against diminished pressure.

A study on autolysis of animal tissues, K. G. DERNBY (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 179-219, figs. 15; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1970).—This paper is a study of the influence of the hydrogen ion concentration on autolysis of animal tissues, using similar methods to those noted above in the study of yeast cells.

In the liver, spleen, pancreas, leucocytes, and mucous membrane of the stomach it has been possible to demonstrate the existence of pepsin-like enzymes which split native proteins to peptones and for whose action the optimum hydrogen ion concentration in all cases is at about $\text{pH}=3.5$. This enzyme can not act in alkaline or neutral solutions. In all these tissues it has also been shown that there are proteolytic enzymes of the type of trypsin or erepsin that attack only peptones or peptids and split them into amino acids. The optimum hydrogen ion concentration for these enzymes is at about $\text{pH}=7.8$, and their action is checked in slightly acid solution. Although both types of proteolytic enzymes occur in all tissues studied, in some of them one or the other of the enzymes has been predominant over the others. Unlike the less specialized enzymes, pancreatic trypsin and gastric pepsin can be easily extracted from the cells.

A special study of the autolysis of pancreas and liver showed that self-decomposition of these tissues proceeds furthest in a range of pH between 5 and 6, the optimum lying between that of pepsin and trypsin. The explanation is that the autolysis is most rapid and complete when both types of enzymes can work simultaneously.

The autodigestion of normal serum through the action of certain chemical agents, I-II, S. YAMAKAWA (*Jour. Expt. Med.*, 27 (1918), No. 6, pp. 689-724, fig. 1).—Two papers are presented.

In the first it is shown that normal serum contains a characteristic protease whose activity is revealed through the action of certain chemical activators, such as acetone, alcohols, and chloroform. The seroprotease has a thermal resistance similar to that of certain proteolytic enzymes, but is easily destroyed by the action of alcohol or acetone beyond certain limits of concentration and temperature.

"The chemical activators may be removed from the activated serum by means of vacuum, dialysis, or extraction with certain indifferent chemicals without causing a return of the serum to its original nonautolytic state. Once activated by these reagents, the serum remains in the activated state, in spite of the removal of the activators. The ferment is highly sensitive to the reaction

of the medium, being readily inactivated when the reaction exceeds a certain narrow limit toward acid or alkaline. The optimal digestion is obtained with a faintly alkaline or neutral reaction."

In the second paper the relation which this ferment bears to the various fatty and lipoidal substances is considered, and also the existence of an antiferment in serum and its relation to the seroprotease.

It was found that the neutral fats, fatty acids, and lipid bodies of serum seem to play no part in autodigestion. Native serum contains an antienzymic substance closely related to the autolytic serum. It has almost the same thermal resistance as the seroprotease. The seroprotease can be removed from the serum by means of the inorganic adsorbents, but the antienzymic substance remains in the serum.

The author concludes that "the autodigestion of the activated serum is due to the spitting of the serum protein by the proteolytic ferment of the same serum and is brought about by the destruction of the antienzymic substance by the chemical reagents. On the other hand, the digestion products in a mixture of a foreign substrate and guinea-pig serum are derived from the direct digestion of the substrate by the serum ferment. This digestion takes place in spite of the presence of the antiseroprotease. The serum separated from the substrate can no longer produce a split product, but is as actively antienzymic as the original serum and undergoes autodigestion only when treated with acetone or other chemical activators."

On the preparation of ovalbumin and its refractive indexes in solution, A. R. C. HAAS (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 119-125; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1982).—In preparing ovalbumin by the method of Osborne and Campbell, previously noted (*E. S. R.*, 12, p. 514), the crystallization of the ovalbumin was found to be dependent upon the hydrogen ion concentration of the globulin-free solution of egg-white crystals, the optimum concentration lying between 10^{-5} and 10^{-6} . The refractive indexes of varying amounts of ovalbumin dissolved in water, in 1 per cent ammonium sulphate, and in various concentrations of sodium hydroxid, measured according to the method described by Robertson (*E. S. R.*, 28, p. 501), were found to follow the law $n - n_s = a \times c$ (*E. S. R.*, 25, p. 709). The average value for a , the constant expressing the change in the refractive index of the aqueous solvent by the addition of 1 per cent protein, was found to be 0.00177 ± 0.00006 .

A method for preparing pectin, C. H. HUNT (*Science*, n. ser., 48 (1918), No. 1234, pp. 201, 202; *abs. in Chem. Abs.*, 12 (1918), No. 20, pp. 2099, 2100).—The author, at the Washington Experiment Station, has developed a method for the preparation of pectin from waste fruit products, such as pomace, by adding ammonium sulphate to the hot-water extract of the fruit and heating to 70°C . The principle of the method is based upon the fact that pectin as extracted from the pulp or pomace is in a colloidal state and can be readily changed by electrolytes. The electrolyte must be nonpoisonous and must be able to produce a reversible precipitation.

It is stated that the amount of pectin recovered by this method is practically equivalent to that recovered by the alcoholic precipitation method, and that concentration of the pectin extract below the boiling point does not impair the quality of the pectin.

Oiticica oil, a new drying oil, E. R. BOLTON and C. REVIS (*Analyst*, 43 (1918), No. 508, pp. 251-254).—The oil is obtained from a Brazilian seed, oiticica or oilizika, probably *Conepia grandifolia*. The kernels contain 62 per cent of an oil which at normal temperature is a semisolid of a yellow color, possessing a heavy odor similar to that of tung oil. The following analytical constants were obtained: Melting point—incipient fusion 21.5°C ., complete fusion 65.09° ;

iodin value 179.5; saponification value 188.6; free fatty acids as oleic 5.7 per cent; unsaponifiable matter 0.91 per cent; and specific gravity, at 15.5°, 0.9694.

Heat polymerization and oxidation tests and tests with metallic driers tend to show that the oil has remarkable properties which might be utilized in the manufacture of varnish and linoleum.

Investigation of *Chenopodium quinoa*, R. GONZÁLEZ (*Investigacion del Chenopodium quinoa* W. (Boliviana). La Paz, Bolivia: [Author], 1917, 2. ed., rev. and enl., pp. 45, pls. 11).—This publication discusses *Chenopodium quinoa* under the following topics: History, botanical characteristics, and uses; qualitative and quantitative chemical analyses; nutritive and digestive value; and the bitter principle or saponin. The composition of the seed was as follows: Protein 13.125 per cent, starch 52.82, cellulose 12.2, moisture 12.5, and ash 5.44. The composition of the ash was silica 1.48 per cent, phosphoric anhydrid 1.05, calcium oxid 3.01, iron oxid 1.87, magnesium oxid 11.53, and potassium 38.86. The starch was very rapidly digested by saliva. The bitter principle proved to be a saponin which has marked antipyretic properties.

The pungent principles of ginger, II, H. NOMURA (*Sci. Rpts. Tōhoku Imp. Univ.*, ser. 1, 7 (1918), No. 1, pp. 67-77).—Continuing investigations previously noted (E. S. R., 39, p. 412), the author has obtained, among the pungent principles other than zingerone, a phenolic substance boiling at from 175 to 185° C., of molecular formula $C_7H_8O_2$. The new substance has been named "shogaol," with reference to its phenolic properties and to the specific name shoga, which is the Japanese for ginger. Experimental evidence is given showing that it is possibly a phenolic ketone.

Isolation and identification of stachydrin from alfalfa hay, H. STEENBOCK (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 1-13; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1993, 1994).—This is a more detailed report of an investigation previously noted (E. S. R., 37, p. 309).

The use of sodium sulphate in the Kjeldahl-Gunning method, C. T. DOWELL and W. G. FRIEDEMANN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 599, 600).—Analyses are reported from the Oklahoma Experiment Station showing that in the use of sodium sulphate in place of potassium sulphate in nitrogen determinations, as suggested by Latshaw (E. S. R., 36, p. 14), either the anhydrous or the hydrated sodium sulphate may be used, and that the time of clearing is not affected appreciably by the water of crystallization of the sodium sulphate. Nitrogen determinations on oat feed, cottonseed meal, dried blood, and mill-run bran showed that the same results were obtained with 5 gm. of potassium sulphate as with 10 gm.

Ammonia and nitric nitrogen determinations in soil extracts and physiological solutions, B. S. DAVISSON (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 600-605, figs. 3).—The author, at the Ohio Experiment Station, has developed a procedure for determining nitric and ammonia nitrogen on the same sample of soil solution. The method is a modification of Potter and Snyder's application (E. S. R., 33, p. 411) of the Folin aeration method for determining ammonia and of the method for determining nitric nitrogen proposed by Allen.¹ The aeration is conducted in the cold over sodium carbonate and the ammonia determined by distillation with magnesium oxid. The nitric nitrogen is determined by reduction with Devarda's alloy in $\frac{N}{10}$ solution in sodium hydroxid.

The apparatus, solutions, and methods of procedure are described in detail.

Nucleic acid and its analytical examination, A. C. CHAPMAN (*Analyst*, 43 (1918), No. 508, pp. 259-263).—The properties of pure plant nucleic acid are

¹ *Jour. Indus. and Engin. Chem.*, 7 (1915), No. 6, pp. 521-529.

described and an outline is given of the procedure to be adopted for the examination of nucleic acid to determine its purity and quality.

On the hydrolysis of proteins in the presence of extraneous materials and on the origin and nature of the "humin" of a protein hydrolysate, R. A. GORTNER (*Science*, n. ser., 48 (1918), No. 1231, pp. 122-124).—This is a criticism of the work of McHargue, previously noted (E. S. R., 38, p. 613).

The author states in conclusion that "(1) proteins can not be hydrolyzed with 20 per cent hydrochloric acid at atmospheric pressure in the presence of a considerable quantity of carbohydrates without appreciably altering certain of the nitrogen fractions of a Van Slyke analysis, and (2) a Van Slyke analysis applied to feeding stuffs, containing as they do nonprotein nitrogenous compounds, gives no valid index as to the presence or absence of any individual amino acid."

A method for making electrometric titrations of solutions containing protein, J. C. BAKER and L. L. VAN SLYKE (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 137-145, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1983).—The authors at the New York State Experiment Station have devised a method by which numerous electrometric titrations can be accurately performed in one solution in the presence of proteins. The apparatus has the advantage of enabling one to prevent "interference by dissolved oxygen, local chemical action at point where the reagent enters the solution under titration, foaming of solution, deposition of protein on electrode, and interference by bacterial action or hydrolysis."

The apparatus is described in detail with an accompanying diagram.

The rate of color production in alkaline solutions of dextrose and picrate, T. ADDIS and A. E. SHEVKY (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 43-51, figs. 9; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1980-1982; *Jour. Soc. Chem. Indus.*, 37 (1918), No. 17, p. 522A).—The authors have shown that "when a solution of dextrose and picrate is heated in the presence of an alkali the rate of production of a color resembling that of sodium picramate increases with increase in the OH concentration and in the degree and duration of heating.

"Although increase in dextrose concentration leads to an increase in the rate of color production, yet within a range of dextrose concentrations corresponding to those derived from hypoglycemic, normal, and hyperglycemic bloods the rate of color production is different for each concentration and does not change in direct proportion to the change in dextrose concentration. But when an amount of sodium carbonate sufficient to produce a concentration of 10 per cent is added and the heating is continued for 45 minutes at 100° C. in the presence of 0.8 per cent picric acid, the rate of color production in all dextrose concentrations within the above range becomes almost directly proportional to the particular dextrose concentrations used."

A modification of the picrate method for blood sugar determinations, T. ADDIS and A. E. SHEVKY (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 53-59, figs. 3).—Proof is given that the condition suitable for the determination of dextrose dissolved in water applies also to the dextrose in the blood filtrates. The method described is an application of the principle noted in the preceding paper.

Determination of moisture in preserves, jellies, and marmalades, C. N. PELTRISOT (*Jour. Pharm. et Chim.*, 7. ser., 17 (1918), Nos. 8, pp. 266-273; 9, pp. 285-291; 10, pp. 319-326).—A critical discussion is given of the present methods, with an interpretation of results.

The author concludes that drying in an oven for 16 hours at a temperature of 100° C., or on a water bath for 6 hours, is preferable to drying in a vacuum. In view of the errors in the present methods, he considers it advisable to decide

upon a new official method and to determine the maximum limit of moisture obtainable by this method from typical samples.

Determination of useful constituents in preserves, jellies, and marmalades: Necessity of establishing a precise official method, C. N. PELTRISOT (*Jour. Pharm. et Chim.*, 7. ser., 18 (1918), No. 2, pp. 33-41).—This is a continuation of the discussion of analytical methods for the examination of preserves, noted above.

The author points out that the consistency of the product is a function of the proportion between the solid matter and liquid products, an increase in the amount of sugar in the limits of its solubility increasing the proportion of liquid and in consequence the fluidity. The proportions are, however, the resultant of the respective quantities of the materials first employed (sugar and fruits) and of the more or less prolonged evaporation which they have undergone.

The advisability is suggested of establishing constants showing the proportions of insoluble dry matter, soluble matter, and total dry matter in products of known proportions of sugar and pulp. These figures would then serve as useful indications in detecting adulteration or careless manufacture of the product.

Estimation of shell in cocoa and cacao products, J. L. BAKER and H. F. E. HULTON (*Analyst*, 43 (1918), No. 507, pp. 197-204; *abs. in Jour. Soc. Chem. Indus.*, 37 (1918), No. 15, p. 438A).—The methods discussed are the levigation process, originally described by Filsinger (*E. S. R.*, 13, p. 17), the percentage of nitrogen, and the percentage of crude fiber. Analytical data are given which show wide discrepancies in results obtained by the different methods.

The authors conclude that in estimating small differences in shell content the available methods are inadequate.

Analysis of "cocoa teas," J. L. BAKER and H. F. E. HULTON (*Analyst*, 43 (1918), No. 507, pp. 189-197; *abs. in Jour. Soc. Chem. Indus.*, 37 (1918), No. 15, p. 437A).—Analytical data are given on the composition of cacao shells, four samples of cocoa teas, and, for purposes of comparison, samples of cacao nibs and alkalinized cocoa. The significance of the analytical data is discussed, and conclusions are drawn as to the composition of the samples of cocoa tea. These consist of cacao shells alone or mixed with varying amounts of nibs. They are used as the basis of the beverage which is sold under the name of "cocoa-shell tea."

Cacao "germ," P. A. E. RICHARDS (*Analyst*, 43 (1918), No. 507, p. 214).—The following analysis is reported of the cacao germ: Percentages on original germ—moisture 7.2 and fat 3.58; percentages on fat-free dry matter—nitrogen 5.5, fiber 3.65, total mineral matter 7.3, soluble mineral matter 4, alkalinity of latter as K₂O 1.69, cold-water extract 28.7, and levigation 33.3. The Zeiss butyro-refractometer reading of the fat was 66 scale divisions at 35° C.

Additive factors for the calculation of fat in milk from the specific gravity and total solids, L. J. HARRIS (*Analyst*, 43 (1918), No. 508, pp. 263-267).—The author proposes a simplified method of calculating the fat in milk from the specific gravity and total solids based on Richmond's formula, $1.2 F = T - \frac{G}{4} - 0.14$, in which T is the percentage of total solids and G the reading of the lactometer. Two sets of factors are given corresponding to values of specific gravity and total solids, respectively. By the direct addition of the two factors the percentage of fat for given values of specific gravity and total solids is obtained. The factors are derived as follows: t (total solids factor) = $\frac{T}{1.2} - 8$, s (specific gravity factor) = $8 - \frac{G}{4.8} + 0.116$.

It is claimed that the comparative compactness of the tables facilitates rapid calculations.

Free lactic acid in sour milk, L. L. VAN SLYKE and J. C. BAKER (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 147-178, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1972; *Jour. Soc. Chem. Indus.*, 37 (1918), No. 17, p. 526A).—Continuing investigations on sour milk, previously noted (*E. S. R.*, 34, p. 802), the authors at the New York State Experiment Station have determined the amount of free lactic acid in solution and the amount adsorbed by the casein. A study was also made of the total acidity of sour milk, the coagulation point, and the first sign of souring.

In determining the amount of free lactic acid the following methods were employed with results in good agreement: (1) Measurement of hydrogen ion concentration and application of calculation based on the mass law; (2) partial extraction by ether and application of calculation based on coefficient of distribution; and (3) double electrometric titration with lactic and hydrochloric acids. It was found that free lactic acid does not appear in appreciable amounts in souring milk for about 20 hours after inoculation when there is present 0.1 cc. of $\frac{N}{10}$ acid in 100 cc. of milk. This increases more rapidly in the next few hours, and finally in 48 hours it is about 20 cc. The pH value changes from 6.5 in fresh milk to 4.17 in 48 hours.

In estimating the amount of free lactic acid adsorbed by casein in sour milk four methods were used with consistent results: (1) Measurement of reduction of hydrogen ion concentration caused by adding casein to lactic acid solutions of given concentration; (2) measurement by titration of reduction of acidity caused by adding casein to lactic acid solutions; (3) titration of acidity of sour milk and of separated whey; and (4) extraction of lactic acid in sour milk by ether and in separated whey. About 20 per cent of the free lactic acid in coagulated sour milk is adsorbed by the casein.

In the study of the acidity of milks soured under different conditions, it was found that "the total acidity by titration varied from 70.5 to 220 cc. of 0.1 N acid per 100 cc. of milk; the free lactic acid, from 8.6 to 104 cc.; the acid as lactate, from 51.8 to 92 cc.; the pH value, from 3.7 to 4.56. In milk souring under ordinary conditions, the total acidity by titration varied from 70.5 to 107.5 cc. of 0.1 N acid per 100 cc. of milk; the free lactic acid, from 13.1 to 34.5 cc.; and the pH value from 4.02 to 4.43."

The casein of milk began to coagulate when the pH value reached 4.64 to 4.78. The time from the beginning of coagulation to completion varied from 30 to 60 minutes, during which period the hydrogen ion concentration remained constant, though the acidity by titration increased slightly.

The first physically and easily perceptible sign of souring in milk is considered by the authors to be a characteristic flavor due to the presence of some volatile compound formed in the souring process and not to lactic acid. There is no apparent relation between either the hydrogen ion concentration or the acidity by titration and the first sign of this flavor.

Methods of varnish analysis, W. T. PEARCE (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 77-79).—"Boughton's method, although it is long and tedious, is satisfactory for resins and oils. We believe it gives the actual values to within 1 per cent. The estimation of rosin is accurate to probably 0.75 per cent."

A study of the fatty acids obtained from varnish oils and from varnishes, I. W. T. PEARCE (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 79-82).—A study was undertaken with the object of finding methods for estimating China wood and other oils that are being substituted for linseed in oil varnishes.

Tables are given of the indexes of refraction, jelly test, and physical characteristics of acid mixtures prepared by making mixtures of the desired oils, saponifying with alcoholic caustic potash, extracting the liberated acids with ether, and drying the solvent-free acids at 110° C.

The determination of cellulose in wood, B. JOHNSEN and R. W. HOVEY (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 9, pp. 132T-137T, figs. 3).—The authors discuss the chlorination method of Cross and Bevan for the determination of cellulose in wood and describe the following modification, which is based upon the hydrolysis of the lower carbohydrates and furfural-yielding substances by a mixture of glacial acetic acid and glycerin of sp. gr. 1.26 in the proportion of their molecular weights. This mixture can be heated at from 135 to 140° C. in an open flask, making it possible to carry out the hydrolysis without complicated apparatus. The glycerin causes the fibrous substances to swell, thus facilitating the action of the chlorine gas. The method is as follows:

Two samples, of about 1 gm. each, of air-dry sawdust passing an 80- but not a 100-mesh sieve are weighed exactly, transferred to small flasks, heated on a water bath for $\frac{1}{2}$ hour with alcohol, filtered into specially prepared Gooch crucibles, and washed with hot alcohol. The samples are transferred to 150 cc. flasks, covered with about 75 cc. of a mixture of glycerin and acetic acid, and heated in an oil bath at 135° for 4 hours, using long glass tubes as condensers. The material is then collected in the crucibles and washed well with water, and the crucible after cooling is placed in the chlorination apparatus. The gas is passed through the crucible for 20 minutes, and the free chlorine is removed by washing once with a cold dilute solution of sulphuric acid. The crucibles are then placed in small beakers containing a 3 per cent solution of sodium sulphite and heated on the water bath for $\frac{1}{2}$ hour. After washing the materials with hot water and cooling, the chlorination process is repeated three times at intervals of about 15 minutes. After the last treatment with sodium sulphite, the fibers are thoroughly washed and dried at 105° to constant weight. The residues are calculated in percentage of bone-dry wood, the moisture of the original sawdust having been determined in a separate sample by drying about 2 gm. of material for 4 hours at 105°.

A discussion, with accompanying tables, is given of the accuracy of the method and of its application in the valuation of woods.

Cellulose, C. F. CROSS, E. J. BEVAN, and C. BEADLE (*London and New York: Longmans, Green & Co.*, 1918, pp. XIX+348, pls. 14).—This is a new impression of the book previously noted (*E. S. R.*, 37, p. 112), with a supplementary chapter on recent and current researches.

Home and farm food preservation, W. V. CRUESS (*New York: The Macmillan Co.*, 1918, pp. XXIV+276, figs. 61).—This book is divided into three sections; the theory of food preservation, methods of food preservation, and food preservation recipes. The aim is to give the reasons for the various methods of food preservation, to present labor-saving methods, and to give simple and explicit directions that may be easily followed. The material presented is designed primarily for the housewife and farmer, but it is hoped that it will be of value and interest to domestic-science teachers and canning demonstrators.

How to can fruits, vegetables, and meats (*Philadelphia: Curtis Publishing Co.*, 1917, pp. 24, pls. 2, figs. 3).—This circular gives directions for canning by the cold-pack method, including information in regard to the use of tin cans, suggestions based on reports of canning difficulties, and a compilation of recipes from various sources.

Preserving and pickling, MARY M. WRIGHT (*Philadelphia: The Penn Publishing Co.*, 1917, pp. 168).—This book contains a few general directions for preserv-

ing and pickling and recipes for preserves, conserves, jellies, jams, marmalades, pickled fruits and vegetables, and winter relishes.

Economics in manufacturing in the canning industry, J. H. SHRADER (*Jour. Amer. Soc. Mech. Engin.*, 40 (1918), No. 8, pp. 686-689; *Amer. Food Jour.*, 13 (1918), No. 8, pp. 424-428, figs. 7).—This paper outlines the general procedure followed in tomato canning and points out the numerous sources of loss. The manufacture of concentrated tomato products, particularly tomato paste, is described.

The conserving of fruits by scientific dehydration, FRANCESCA BATES (*Better Fruit*, 13 (1918), No. 2, pp. 5, 6, fig. 1).—This article describes the process of dehydration of fruits and vegetables and outlines its advantages.

How to dry fruits and vegetables (*Philadelphia: Curtis Publishing Co., 1917*, pp. 19, figs. 13).—This is a compilation of information from various sources.

Exploitation and utilization of raisin seeds, J. VENTRE (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 39 (1918), Nos. 28, pp. 31-38; 29, pp. 54-61, figs. 2; 30, pp. 80-85).—The possible utilization of raisin seeds, particularly for the extraction of edible and illuminating oils, is discussed. Analytical data have been compiled on the amount of seeds available in different parts of France and on the composition of the seeds and of the resulting oil. Methods to be employed in the commercial separation of the seeds from the raisins in the manufacture of the oil are discussed.

METEOROLOGY.

Climatic factors in relation to farm management practice, J. W. SMITH (*Amer. Farm Management Assoc. Proc.*, 7 (1916), pp. 63-79).—This article discusses factors determining the climate of different parts of the United States, climatic zones, changes in climate, selection of location with reference to crop production, and relation of weather to cost of labor, crop risks, insect damage, and marketing.

A short bibliography of the subject is appended.

The relation between temperature and crops, D. A. SEELEY (*Rpt. Mich. Acad. Sci.*, 19 (1917), pp. 167-196, pl. 1, figs. 2).—This article reviews previous investigations bearing on the general subject, reports two years' observations on the temperature of leaves of the garden strawberry, and discusses the bearing of such data upon the relation between temperature and plant growth.

It was found that "the plant thermometer readings were usually lower than the air temperatures in the early morning, the minimum readings about 3 to 4° F. lower than the minimum temperatures recorded in the instrument shelter. Differences were more pronounced, of course, when the weather was clear and the air still. The plant cooled off more rapidly in the evening than the air which surrounded it, the 7 p. m. readings usually registering 3 to 4° lower than the dry bulb thermometer. On very warm days, with clear skies, a difference of 9 to 10° was registered at 7 p. m., the plant cooling off much faster than the air. But the most striking difference in temperature occurred during the heat of the day, frequently amounting to 20°, and on a few days the plant thermometer registered 36° higher than the air temperature, at the midday observation. On such dates the air was specially clear and still. On but 41 days out of the 304 on which observations were made at midday did the plant thermometer register lower than the air thermometer. These were invariably dark and cloudy, many of them with rain falling at the time of observation."

The 304 simultaneous observations of plant and air temperatures made at midday in 1915 and 1916 were studied "in connection with the cloudiness, in order to determine factors which can be used to give proper values to temperature readings made on clear, partly cloudy, and cloudy days, respectively." It

was found that the average difference in round numbers "between the plant and air temperature in full sunshine was 15° ; in partial sunlight, due to thin clouds or intermittent cloudiness, it was 10° ; and less than 1° when the sky was thickly overcast, so that the sun's disk was invisible."

From these averages the following formula for finding the effective temperature from the recorded thermometer readings is deduced: " $T=t+15\text{ C}+10\text{ P}$, in which T is the sum of the effective temperature for plant growth, t is equal to $m-42X$, m being the sum of all maximum temperatures above 42° during the period in question, and X being the number of such days, C is the number of clear days during the period, and P is the number of partly cloudy days. In other words, the sum of the maximum temperatures above 42° during any period, after 42 has been subtracted from each, is to be increased by 15 for each clear day and 10 for each partly cloudy day during the period. This leaves out of consideration the excess of 1° in temperature during cloudy weather, which is so small that it may well be disregarded."

A list of references to literature cited is given.

Physics of the air, W. J. HUMPHREYS (*Jour. Franklin Inst.*, 184 (1917), Nos. 2, pp. 137-178; 3, pp. 371-408; 4, pp. 527-551; 5, pp. 651-674; 6, pp. 805-836; 185 (1918), Nos. 1, pp. 83-117; 3, pp. 359-372; 4, pp. 517-538; 5, pp. 611-647; 6, pp. 785-824; 186 (1918), Nos. 1, pp. 57-75; 2, pp. 211-232; 3, pp. 341-370; 4, pp. 481-510, figs. 122).—This series of papers is an orderly assemblage of the widely scattered facts and theories relating to the physical phenomena of the earth's atmosphere. Together they constitute a treatise for the student of atmospherics.

Free-air data at Drexel Aerological Station, January to June, 1917, W. R. GREGG (*U. S. Mo. Weather Rev. Sup. 10* (1918), pp. 101, pls. 7).—The results of 249 observations at an average altitude of 2,959 meters are tabulated and briefly discussed.

SOILS—FERTILIZERS.

War work at Rothamsted, E. J. RUSSELL (*Country Life* [London], 44 (1918), No. 1123, pp. 39, 40).—It is stated that by mutual agreement between the experts representing the Food Production Department of Great Britain, problems relating to soils and fertilizers have been assigned to Rothamsted. Among the problems which have been taken up are the most effective ways of utilizing the available resources of nitrogenous and phosphatic fertilizers and of increasing the supplies of potash; the utilization of the stored-up plant food in grass lands when brought under cultivation, and of controlling insect pests in such lands; the use of root nodule bacteria and leguminous plants to increase the nitrogen supply of the soil; and the management of farmyard manure to prevent waste.

Investigations on the cause of loss in manure and the best way of dealing with it have shown that the problem of managing a manure heap to prevent loss is "to shut out air and keep off rain." Much work is also being done in testing substances of possible fertilizing value, on methods of partial sterilization of soil, and in the study of new methods that may increase crop production, such as electrification. Studies of factors which control the production of wheat are planned.

Soils of Latah County, Idaho, P. P. PETERSON (*Idaho Sta. Bul. 107* (1918), pp. 3-21, figs. 5).—This bulletin presents a description of the soils of an area surveyed by the Bureau of Soils, of the U. S. Department of Agriculture, as already noted (*E. S. R.*, 37, p. 21), including chemical analyses.

Notes on the agricultural value of the soils of Morocco, M. and L. RIGOTARD (*Rev. Sci. [Paris]*, 56 (1918), No. 15, pp. 463-470).—Results of physical and chemical examinations of a considerable number of representative soils of

Morocco are reported and discussed. It is stated that as a rule the chemical and physical composition of the soils is satisfactory, although generally deficient in phosphoric acid. Many of them are well supplied with lime.

The water reserve in soils in times of drought, J. DUMONT (*Rev. Sci. [Paris]*, 56 (1918), No. 16, p. 510).—It was found that the moisture content was influenced to a large extent by manure. Heavy applications of manure incorporated with the soil maintained a considerable percentage of moisture (17.8 per cent) in the surface soil during drought. As a result the crop (sugar beets) on all manured plats made good growth and apparently did not suffer from lack of moisture, while the sugar beets on the unmanured plats suffered much injury from lack of moisture, especially in the earlier stages of growth. The experiments emphasize the importance of an adequate supply of moisture in the surface soil, particularly at the beginning of crop growth.

Rise of temperature on moistening dry soils, C. RIVIÈRE (*Rev. Hort. [Paris]*, 90 (1918), No. 5, pp. 85, 86).—Experiments are briefly reported which indicate that the rise and fluctuations of temperature when soils are moistened are much less in a soil which is naturally humid or has previously been pulverized than in an arid soil. In no case, however, are these reactions sufficiently great to injure vegetation except in the early period of growth, and in general they are not considered of appreciable significance in ordinary practice.

The effect of heat on some nitrogenous constituents of soil, R. S. PORTER and R. S. SNYDER (*Soil Sci.*, 5 (1918), No. 3, pp. 197-212, figs. 4).—The authors describe investigations conducted at the Iowa Experiment Station to ascertain the effect of heat upon soil nitrogen as nitrate, ammonia, amino acid, and soluble nonprotein nitrogen. The plan of the experiment comprised the heating of 350-gm. samples of Calhoun silt loam, Miami silt loam, and peat soils for 2 hours at 100 and at 200° C. dry heat and in the autoclave at 15 lbs. for 3 hours and at 10 lbs. for 3 hours per day for 3 successive days. Soil heated for 2 hours at 200° and in the autoclave at 10 lbs. for 9 hours was also inoculated with fresh soil emulsion and incubated for 10 and 20 weeks. Tabulated data are presented and fully discussed showing the amounts of the various forms of nitrogen in each soil type before and after the different treatments, and the effect of the treatments on the different forms of nitrogen in each soil are depicted graphically.

The following conclusions were reached with respect to the heat treatments: The amount of ammonia increased with all heat treatments, the higher temperatures giving in general greater increases. At 10 lbs. the increase was greater than at 15 lbs., due to the longer time the soils were heated at 10 lbs. Peat soil heated at 200° contained less ammonia than that heated at any other temperature, due to an excessive volatilization of ammonia at that temperature. The amino-acid nitrogen results in general followed those for ammonia nitrogen, the peat soil again being an exception, not much of any change occurring with any of the treatments. Not much change in the nitrate content resulted from dry heat at 100°, but 10 lbs. in the autoclave for 9 hours increased the amount considerably in every soil. Fifteen lbs. for 3 hours caused a somewhat less increase than the 10-lb. treatment. A temperature of 200° caused almost the total disappearance of all nitrates. All heat treatments caused an increase in soluble nonprotein nitrogen, the least change occurring in the peat soil, probably due to a loss of considerable amounts of ammonia from the soil at the higher temperatures.

The following conclusions have been drawn from the results for soil heated to 10 lbs. in the autoclave for 9 hours and that heated to 200° for 2 hours, both later inoculated and incubated as noted above: The three mineral soils heated to 10 lbs. for 9 hours and with 10 weeks' incubation after inoculation

with fresh soil showed an increase of ammonia. Twenty weeks' incubation likewise caused an increase in two cases, though to a less degree than the 10-week period. Twenty weeks' incubation of the Calhoun soil caused a slight decrease in ammonia. The amount of ammonia in the peat soil was not greatly influenced by either incubation period. Ten weeks' incubation caused a decrease in amino nitrogen, there being more at the end of 20 weeks than at the end of 10, and in two of the soils there was more amino nitrogen at the end of the 20 weeks than at the beginning of the experiment. Nitrates were invariably increased by the two incubation periods, the longer period usually giving the greater increase. The amount of nonprotein nitrogen was not materially changed by incubation of the mineral soils which had been heated to 10 lbs. In the peat soil 20 weeks decidedly lessened the amount of this group of compounds. In the mineral soils heated to 200° there was always an increase in soluble nonprotein nitrogen after incubation, the peat soil again showing a decrease for both incubation periods.

Sampling field plats for bacterial analysis, H. A. NOYES (*Abs. Bact.*, 2 (1918), No. 1, p. 3).—The author maintains that for bacteriological study the most satisfactory results are obtained by sampling field plats in the spots showing the greatest uniformity in chemical tests. Samples were taken at regular intervals, care being exercised to avoid sampling where previous samples may have impaired the cultural practice under investigation. The following conclusions are deemed justified:

The results of bacterial analysis can be correlated with differences in the aeration of the plats more than with any other factor. The smallest variations occur where there is uniform average ranking of the places sampled. Where cultural practice or fertilizer treatment is changing the organic matter in the soil, the change is in the same direction on all spots chosen by this method.

Weight of field soil necessary to be taken for bacterial analysis, H. A. NOYES and E. VOIGT (*Abs. Bact.*, 2 (1918), No. 1, pp. 3, 4).—In tests made at the Indiana Experiment Station, samples of more than 50 gm. of fresh field soil were not found to increase agreement between triplicate tests, while samples of less than 40 gm. caused large variations in some soils, and samples of less than 25 gm. were deemed entirely unsatisfactory. A standard sample of 50 gm. was adopted by the authors and put with 200 cc. of sterile distilled water to make the first bacterial dilution.

Effect of carbon dioxide gas on bacterial numbers, ammonification, and nitrification, H. A. NOYES and L. YODER (*Abs. Bact.*, 2 (1918), No. 1, p. 3).—This reports the results of tests with cropped soils subjected to carbon dioxide treatments for a period of nine months under greenhouse conditions. One series of pots received no carbon dioxide, a second received the gas at the rate of 640 cc. per hour per pot for eight hours each day, while a third series was treated continuously at the same rate. The results obtained are given in the following table:

Effect of carbon dioxide gas on bacterial numbers, ammonification, and nitrification.

Factors studied.	First series, no carbon dioxide treatment.	Second series, eight hours' carbon dioxide treatment.	Third series, continuous carbon dioxide treatment.
Bacterial numbers. {Air.....	100	103.2	111.3
Hydrogen.....	100	100.1	111.1
Ammonification.....	100	98.2	98.2
Nitrates in soil before incubation.....	100	132.3	154.2
Nitrates in soil after incubation.....	100	97.4	86.2

Isolation and study of the nitrifying organisms, W. M. GIBBS and E. B. FRED (*Abs. Bact.*, 2 (1918), No. 1, p. 1).—This describes an attempt to isolate *Nitrosomonas* and *Nitrobacter* from a light-colored upland silt soil neutral in reaction, a light-colored silt acid in reaction, and a black garden soil high in organic matter and neutral in reaction. Liquid culture media containing ammonia nitrogen for the nitrite formers and similar media containing nitrite nitrogen for the nitrate formers were inoculated separately with the different soils.

Ammonium sulphate and sodium nitrite gave the most rapid oxidation, the average time required for the oxidation of ammonium sulphate being 7 days and for the oxidation of sodium nitrite about 6 days. All attempts to secure pure cultures by means of enrichment cultures and high dilutions failed. The total number of nitrifying organisms increased with the number of enrichment cultures, while this process was also accompanied by a gain in the number of contaminating forms, including a small coccus and a rod. Washed agar and silicic acid jelly gave the best results for isolation. It was found to be more difficult to isolate *Nitrosomonas* than *Nitrobacter*.

Pure cultures of these organisms were cultivated for a long period of time without any loss of their oxidizing power. The source of the organism apparently had no effect upon its morphology or its physiological activities.

Soil reaction and the presence of *Azotobacter*, P. L. GAINES (*Science*, n. ser., 48 (1918), No. 1232, pp. 139, 140).—Briefly summarizing the results of culture tests and determinations of the hydrogen ion concentration of the aqueous extract of a large number of soils collected under widely varying conditions, the author concludes that "the absolute reaction is probably the major factor controlling the presence of *Azotobacter* in soils."

The potassium requirements of *Bacillus subtilis*, G. P. KOCH (*Abs. Bact.*, 2 (1918), No. 1, p. 2).—While maintaining the salts in a 3-salt nutrient solution in the same proportion, the total osmotic concentration of the solution was reduced from 0.1 to 0.09 atmosphere without influencing the amount of ammonia formed from dialyzed peptone by *B. subtilis*. Potassium was found to be essential to the development and activities of the organism, and when there was not sufficient potassium present, magnesium sulphate and calcium phosphate did not affect the ammonia formation. The maximum activity of *B. subtilis* was obtained by the addition of 0.24 mg. potash to the 0.1 mg. already present in the dialyzed peptone. Applying 2.5 and 5 times this amount of potash did not increase the activities of the bacteria.

Copper and zinc as antagonistic agents to the "alkali" salts in soils, C. B. LIPMAN and W. F. GERICKE (*Amer. Jour. Bot.*, 5 (1918), No. 4, pp. 151-170, figs. 2).—Pot experiments with barley grown on Berkeley adobe soil and Oakley blow sand are described in a study of the antagonism of copper and zinc salts to the common alkali salts of soils. Sodium chlorid, sodium sulphate, and sodium carbonate were used in toxic and constant quantities, and copper sulphate, zinc sulphate, copper chlorid, zinc chlorid, and copper carbonate were added in varying amounts within a given series of cultures. Seven series in duplicate were conducted with each soil type, the plants being grown to maturity, harvested, dried at 100° C., and the dry weights of tops and roots and of straw and grain determined in every case. The data for each series of cultures are presented in tabular form and fully discussed. The results may be briefly summarized as follows:

Copper and zinc antagonized sodium chlorid, sodium sulphate, and sodium carbonate in the Berkeley adobe soil, the antagonism being evident even with three successive barley crops used as criteria and when only the metallic ions varied. When four ions were introduced (copper sulphate and sodium chlorid) the an-

tagonism was as fully or even more apparent. Similar evidences of marked antagonism were observed with one barley crop grown on Oakley sand, especially in the case of copper sulphate *v.* sodium chlorid.

"These findings should possess considerable significance in the field reclamation of alkali lands, and particularly in the case of those which do not contain large enough quantities of salts to render them unfit for plant growth by reasons of high osmotic pressures in their soil solutions."

Carbonic acid gas in relation to soil acidity changes, H. A. NOYES and L. YODER (*Soil Sci.*, 5 (1918), No. 2, pp. 151-160, pl. 1, figs. 4).—Investigations are described which were "designed primarily to obtain data on the effect of carbon dioxid additions to soil in relation to soil and plant changes." Equal weights of soil were put into paraffined Wagner pots and treated with single (770 parts calcium carbonate per million of dry soil), double, and triple applications of lime and of fertilizers (bone, acid phosphate, dried blood, and sodium nitrate). Distilled water was added to bring the moisture content up to one-half saturation, and small pepper plants were transplanted into the pots. The soil employed showed an acidity of 0.0233 (Hopkins) and 0.1540 (Veitch) parts of calcium carbonate per 100 parts of dry soil at the beginning of the experiment. The work was conducted in the greenhouse from February 4 to December 5, 1916. Each series consisted of 9 pots, 3 receiving no application of carbon dioxid, 3 in which the gas bubbled into the soil daily between 8 a. m. and 4 p. m., and 3 in which it bubbled constantly into the soil. Carbon dioxid applications were made from April 16 to the end of the investigation, the gas being applied at the rate of approximately 650 cc. (under standard conditions) per hour of treatment given. Tabulated data are presented showing the effects of cropping, fertilizing, liming, and of applications of carbon dioxid on soil acidity. The results are discussed, and the following conclusions reached:

Soil kept at one-half its water-holding capacity increased in acidity. Cropping soil kept at one-half its water-holding capacity increased its acidity. This increased acidity of cropped soil was modified by different applications of calcium carbonate, and varied with different fertilizer applications. Carbon dioxid added to cropped soil treated with lime alone or lime and fertilizer increased the acidity of the soil.

"The results of these experiments support chemical theories as to the nature and causes of soil acidity. The changed reactions of this soil toward a neutral salt of a strong base and a strong acid (potassium nitrate) after subjection to the varied conditions of the experiment at least suggest that soil acidity is largely the result of hydrolytic mass action phenomena."

On the "rawness" of subsoils, C. B. LIPMAN (*Science*, n. ser., 46 (1917), No. 1186, pp. 288-290).—The author presents some critical comments on a recent paper on the subject of infertility of subsoils by Alway, McDole, and Rost (*E. S. R.*, 37, p. 20), with particular reference to observations made by Hilgard and Wohltmann on the subsoils of arid regions.

On the basis of his own observations of soil conditions in the citrus and alfalfa growing districts of the Great Valley of California, the author concludes that "subsoils of arid regions are certainly no less 'raw' than those of semi-arid regions, and probably only slightly less so than those of humid regions. If, as seems as yet unproved, inoculated legume seeds fail to develop on humid subsoil material, such failure can not justifiably be attributed, as is done by Alway, McDole, and Rost, to a lack of available phosphoric acid and potash. A lack of available nitrogen probably is sufficient to account for rawness of subsoils. The poor aeration of subsoils, which indirectly results in their rawness, may be accounted for more simply than by Hilgard's explanation of

the washing down of fine particles into the subsoil, which prevents proper aeration."

The "rawness" of subsoils, F. J. ALWAY (*Science, n. ser.*, 47 (1918), No. 1208, pp. 196-198).—This is a reply to the criticism noted above.

It is maintained that the subsoils involved in the field observations made by the author and his associates were regarded by them as strictly humid, and it is pointed out that while "the 'rawness' of humid subsoils toward legumes as well as nonlegumes is generally assumed by soil investigators, the burden of [their] paper was to prove that in the case of the loess subsoils of the humid portion of eastern Nebraska there was no rawness toward inoculated legumes. We offered no evidence and made no claims as to the rawness of any subsoils other than those of the loess region of Nebraska."

Handling barnyard manure in eastern Pennsylvania, D. A. BRODIE (*U. S. Dept. Agr., Farmers' Bul.* 978 (1918), pp. 24, figs. 4).—The manure-yard method of handling manure in Chester County, Pa., is described, in which the stable manure is stored in a walled yard partly or wholly covered and trampled by stock turned into the yard for exercise during the day. The cropping systems followed in the region and the care and utilization of the manure are discussed, and the farm practices of 10 successful farmers who followed the manure-yard method are outlined.

Average yields for the State in 1912 amounted to 42.5 bu. per acre for corn, 18 bu. for wheat, 33.1 bu. for oats, and 1.43 tons for hay, as compared with average yields from the 10 selected farms of 85.5 bu. for corn, 29.75 bu. for wheat, 45 bu. for oats, and 2.65 tons for hay. Yields obtained on 378 representative farms in Chester County were also found to be considerably higher than the averages for the State.

Water-holding capacities of bedding materials for live stock, amounts required to bed animals, and amounts of manure saved by their use, J. W. WHISENAND (*Jour. Agr. Research [U. S.]* 14 (1918), No. 4, pp. 187-190).—In experiments at the Illinois Experiment Station, here reported, sacks containing 5 to 7 lb. samples of oat straw, cut and uncut, wheat straw, shavings of different kinds, and sawdust were soaked for 12 hours in water, hung up in a room in a barn until dripping had practically ceased (after 5 hours) and weighed. They were weighed again after hanging for 24 hours.

The results indicated that "the common belief that the shavings commonly used for bedding live stock have much greater water-holding capacity than straw is erroneous. Oat straw retained approximately twice as much water as shavings and 15 to 20 per cent more than wheat straw."

In comparative trials of the materials for bedding, in which "no special attempt was made to regulate the amount of bedding used, the men in charge of each barn bedding as usual," it was found that "to keep animals bedded, 40 to 82 per cent more shavings than oat straw and 9 to 18 per cent more wheat straw than oat straw were required. The amount of animal excreta removed from the barn in the manure was about the same regardless of the kind of bedding material used."

Autumn v. spring manuring (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 18 (1918), No. 2, pp. 142-150, pls. 2).—Experiments are described in a comparison of fall and spring applications of manure alone and of manure supplemented with spring applications of commercial fertilizers for potatoes, mangels, and turnips during the period of 1913 to 1916, inclusive.

Fall applications showed average yields of potatoes of about 397.6 bu. per acre for manure alone and 480.6 bu. for manure and commercial fertilizers, as compared with 432.6 and 491.8 bu. for the spring applications. Yields of

mangels amounted to about 31 tons for manure applied alone in the fall and 37.9 tons for manure and commercial fertilizers, while similar applications in the spring showed average yields of 34.1 and 39.6 tons, respectively. Turnip yields amounted to 23.2 and 25.7 tons, respectively, for fall applications of manure and of manure and fertilizers, while spring applications produced yields of 28.5 and 27.7 tons, respectively.

Green manuring (*Rpt. Agr. Dept. Mysore, 1917, pp. 20, 21*).—In a study of the effect of green manure when plowed in with and without the addition of calcic and dolomitic limestone, the results so far are summarized as follows:

"The increase in nitrogen begins about a month after the green manure is plowed in, reaches a maximum about the third month, and then decreases gradually. During the last season the effect of the green manure had almost disappeared by the end of the eighth month. This season the increase is persistent, probably due to the large quantity of green material added. The addition of limestone did not lead to any better retention of nitrogen in the soil, but produced somewhat better yields of green manure and ragi. No difference could be observed in the action of calcium and magnesium limestones. About 45 per cent of nitrogen contained in the green material added in pot experiments, and about 64 per cent in plat experiments, could not be satisfactorily accounted for. The green manured plats showed an improvement over the unmanured ones in texture, water-holding capacity, and humus contents."

The significance of the sulphur in sulphate of ammonia applied to certain soils, C. B. LIPMAN and W. F. GERICKE (*Soil Sci., 5 (1918), No. 1, pp. 81-86*).—Supplementing previous work (E. S. R., 36, p. 726), the authors describe pot experiments conducted, at the California Experiment Station, with barley grown on Oakley blow sand in the greenhouse to determine the rôle of sulphur when used in conjunction with various nitrogenous fertilizers.

Two parallel series of pots were run, one receiving nitrogen at the rate of 1,000 lbs. of dried blood per acre in the form of sulphate of ammonia, nitrate of soda, nitrate of lime, and dried blood; and the second receiving the same nitrogenous fertilizers plus sulphur, as flowers of sulphur, sulphuric acid, and sodium sulphate, in amounts equivalent to the sulphur contained in the sulphate of ammonia application alone. Untreated pots and pots receiving sulphur alone were used as control. Tabulated data, gathered at the end of the growing season, which show the number and height of shoots; the number of heads; and the yields of straw, grain, and roots obtained in the experiment, are fully discussed.

The results are held to indicate that sulphate of ammonia is far superior to the other nitrogenous fertilizers for barley on this soil; that sulphur in all of the forms tested, when supplementing nitrate or dried blood, induced marked increases in barley growth over that obtained from nitrogen alone; and that sulphur alone was practically without effect. In view of these results, the improvement of these and similar soils in the State is deemed to depend chiefly upon the supplying of nitrogen in some readily available form until the nitrogen and organic-matter content of the soil has been increased by green manure and by nitrogen-fixing bacteria. For the best results with annual crops, sulphur in some form, probably as flowers of sulphur, is needed to supplement the nitrogenous fertilizers, unless sulphate of ammonia is used.

Some availability studies with ammonium phosphate and its chemical and biological effects upon the soil, F. E. ALLISON (*Soil Sci., 5 (1918), No. 1, pp. 1-80, figs. 10*).—The author describes extensive investigations with a commercial ammonium phosphate, to determine the relative availability of the ammonia as compared with that in ammonium sulphate, and of the phosphorus as

compared with that in acid phosphate. The experimental work included an analysis of the material employed; biological studies embracing observations on the nitrification of the ammonium phosphate in different soils as compared with other nitrogenous materials and a study of the effect of ammonium phosphate upon the ammonification of organic matter; and various availability experiments in the field and in pot and tumbler trials with different soils in the greenhouse, including observations of the effect on the lime requirement and on germination. The methods employed are described in detail, and the data are presented in tabular form, illustrated graphically, and fully discussed for each phase of the investigation. The principal points brought out by these studies may be briefly summarized as follows:

The commercial ammonium-phosphate fertilizer used contained approximately 13.5 per cent ammonia and 43 per cent phosphoric acid, 96.5 per cent of which was either water or citrate soluble. Ammonium sulphate and ammonium phosphate nitrified at approximately the same rate, while dried blood, cottonseed meal, and tankage were considerably less available, usually in the order named.

A gradual increase in nitrate accumulation occurred in tumblers up until the sixth week in a rich garden soil, and until 8 to 10 weeks in a meadow soil. After the maximum accumulation in the garden soil the decline was quite rapid, showing the importance of nitrate assimilation by microorganisms. Calcium carbonate proved to be especially favorable for nitrification, while calcium oxid sometimes caused an actual depression in nitrification with both ammonium sulphate and ammonium phosphate.

Ammonium phosphate increased the rate of ammonification of cottonseed meal, but decreased that of dried blood. Green alfalfa was not appreciably affected by the presence of the fertilizer.

Soil fungi utilized nitrogenous salts in solution in the following order: Ammonium phosphate (showing the best results), ammonium carbonate, ammonium sulphate, urea, ammonium nitrate, and sodium nitrate.

As an average of all conditions the recoveries of nitrogen applied to Norfolk sand, yielding six crops (one of barley, four of buckwheat, and one of corn), were 65.88, 61.10, 43.74, and 41.19 per cent, respectively, for ammonium phosphate, ammonium sulphate, dried blood, and cottonseed meal. On a sassafras loam the average recoveries, in the same order, were 48.46, 50.42, 42.51, and 36.49 per cent. Liming usually increased the recovery of nitrogen. Crop yields were about in the same ratio as the nitrogen recoveries, except that under very acid conditions, frequently ammonium sulphate showed a higher recovery of nitrogen than ammonium phosphate, but a much smaller crop. The comparatively low recovery of the nitrogen added led the author to believe that a considerable amount of nitrogen escaped from the soil as free nitrogen gas or ammonia or was given off from the plants themselves.

The average results for two limed and unlimed soils with two rates of fertilizer applications showed the following increases in lime requirement over checks, due to the fertilizers applied: Ammonium sulphate, 794 lbs. of calcium oxid; ammonium phosphate, 525 lbs.; dried blood, 263 lbs.; and cottonseed meal, 113 lbs.

Pot experiments in sand showed the nitrogen in commercial ammonium phosphate, water-soluble extract of ammonium phosphate, and sodium nitrate to be of practically the same availability. Water-insoluble ammonium phosphate showed only a slightly lower yield than the other forms of nitrogen. Experiments with soils in the greenhouse, as an average, showed little difference in the availability of the phosphorus between ammonium phosphate, acid phos-

phate, and basic slag, while raw rock phosphate gave much smaller increases. On very acid soils acid phosphate was sometimes superior to ammonium phosphate, the acidity not being increased to any great extent, if at all, by the former, while ammonium phosphate increased acidity somewhat. In quartz sand the relative increases over the check were for ammonium phosphate 9.95 gm., acid phosphate 9.5 gm., and raw rock phosphate 3.1 gm.

Ammonium phosphate, on the basis of the amount of nitrogen present, showed about the same toxicity to germination and early growth as ammonium sulphate and less than sodium nitrate or ammonium chlorid when applied to soils in high concentrations. Very sandy soils required only about one-tenth as much fertilizer in tumblers to produce a given injury as heavy clay or silt soils. Commercial ammonium phosphate was no more toxic than pure monoammonium phosphate. Liming decreased the growth of young corn plants at the lower rates of application of the fertilizers in the germination experiments, but favored the plants at the higher rates.

Using various combinations of fertilizers did not lessen the injury of individual salts to any extent, if at all. Corn, buckwheat, barley, wheat, and oats were resistant to large applications of fertilizers, while vetch, rape, and cowpeas were relatively susceptible. Under laboratory conditions, using tumblers holding 200 gm. of soil, the injury produced by a given amount of the fertilizers was practically the same whether applied in direct contact with the seed or uniformly mixed with the soil. Under field conditions applications of 100 lbs. of ammonium phosphate per acre in the row did not injure the germination of corn, while 150-lb. applications showed a slight injury.

In concluding, the author states that "ammonium phosphate fertilizer is in general of the same value as an equivalent amount of nitrogen as ammonium sulphate and phosphorus as acid phosphate, and may be used as a substitute for these other forms of plant food. . . . Ammonium phosphate is readily nitrified and utilized by both microorganisms and plants.

"From the standpoint of injurious effects when applied in high concentrations, ammonium phosphate is again similar to ammonium sulphate and slightly less toxic than sodium nitrate."

A list of references on the subject is appended.

Experiments with sulphur-phosphate composts conducted under field conditions, J. G. LIPMAN and H. C. McLEAN (*Soil Sci.*, 5 (1918), No. 3, pp. 243-250).—A series of experiments with sulphur-floats-soil compost conducted under field conditions at the New Jersey Experiment Stations are described, and are said to demonstrate the value of the compost in rendering available the phosphorus of floats, thus confirming earlier experiments already reported (*E. S. R.*, 36, pp. 26, 821; 38, p. 817). The studies also indicate the best form of compost from a standpoint of adequate aeration.

Various mixtures of a red silt loam soil and compost, sulphur, floats, and aluminum and ferrous sulphates were placed in porous earthenware pots set in the ground with the tops flush with the surface of the soil. One series of pots was covered with waterproof canvas, while corresponding series was left uncovered, and the quantity of available phosphoric acid present in each pot at the beginning of the experiment and after 8, 11, 15, and 20 weeks was calculated in pounds of P_2O_5 per ton of compost. The covered pot containing soil, floats, and sulphur showed the maximum accumulation, 36.86 per cent of the total P_2O_5 , in an available form after 20 weeks, as compared with 29.63 per cent from the corresponding pot left uncovered, the difference being ascribed to leaching. The aluminum and iron salts seemed to bring about a small increase in the uncovered pots, 32.96 per cent of the total P_2O_5 being rendered available with the salts. In the covered series 32.55 per cent was

rendered available with the salts. These results differed from those obtained in the laboratory, thought to be due to the fact that the salts were not added until 5 weeks after the experiment was begun.

In October, 1916, a number of 2-ton composts of varying composition were made up of a red silt loam soil, sulphur, manure, and floats (containing 31.12 per cent P_2O_5) and exposed to the weather. The quantity of available phosphoric acid was determined after 10, 21, 27, 38, and 44 weeks. Marked changes in the availability of the P_2O_5 were obtained only when the floats was composted with sulphur. Sulfonation appeared to be stimulated by the advent of warm weather and to attain a maximum from May 12 to September 3. A compost of 3,400 lbs. of soil, 400 lbs. of floats, and 200 lbs. of sulphur showed the highest yield of available P_2O_5 after 44 weeks, amounting to 75.87 per cent. The addition of 200 lbs. of manure to this compost showed an accumulation of 75.85 per cent of available P_2O_5 . With the quantities of sulphur and floats doubled, only 39.65 per cent of the total P_2O_5 was rendered available, while the addition of 200 lbs. of manure resulted in an accumulation of 69.16 per cent of available P_2O_5 . It was concluded from these observations that composts should be made up in warm weather and so constructed as to permit free access of air.

Floats and floats and sulphur were thoroughly mixed with a sassafras gravelly loam soil in plats 4 ft. square to a depth of about 6 in., and the composts were stirred every week to study the effect of composting in shallow piles. The quantity of available P_2O_5 was determined after 6, 15, and 20 weeks. At the end of the period 35.41 lbs. of P_2O_5 per ton of compost had been rendered available in the soil-floats-sulphur combination, as against only 3.26 lbs. for the soil-floats compost. This led to an experiment to determine the best depth for distributing sulphur and floats in the soil in order to obtain a maximum accumulation of available P_2O_5 . Plats 2 ft. square were excavated to depths of 0.5, 1, 2, 3, and 4 in., and the excavations were filled with a mixture of soil, floats, and sulphur. The plats were cultivated by ordinary tillage implements once a week, and the available P_2O_5 was determined at the end of 7 and 14 weeks. The quantities obtained after 14 weeks amounted to 13.4, 16.2, 21.2, 24.95, and 25.9 lbs. per ton of compost, respectively, for the different depths.

Relative efficacy of the different phosphatic manures (*Scot. Jour. Agr.*, 1 (1918), No. 2, pp. 196-198).—The results of one year's experiments at Kilmarnock, Scotland, comparing superphosphate (8 cwt. per acre), basic slag, bone meal, dissolved bone, ground mineral phosphate, guano, etc., on potatoes, are summarized and discussed. The phosphates were applied in quantities furnishing equal amounts of phosphoric acid, in connection with a basic fertilizer supplying potash in the form of sulphate ($2\frac{1}{2}$ cwt. per acre), and nitrogen in the form of ammonium sulphate (2 cwt. per acre). The soil was a uniform medium loam on which a crop of oats had been grown the previous year, but which prior to that time had been in grass for many years and was apparently so well supplied with organic matter that no manure was used.

The yields were directly in proportion to the solubility of the phosphate used, the relative order of efficacy being superphosphate, basic slag, and dissolved bone, with mineral phosphate giving much the poorest yield. The superphosphate gave not only the largest yield but also the most profitable return. The general conclusion is drawn that the application of readily available phosphatic fertilizer is a factor of very great importance in increasing the production of potatoes.

The recovery of potash from blast-furnace gases (*Nature [London]*, 101 (1918), No. 2530, pp. 147, 148).—This is a review of a paper by R. A. Berry and

D. W. McArthur presented at a meeting of the West of Scotland Iron and Steel Institute, discussing the results of studies by others and recording certain observations by the authors relating particularly to the potash carried by the various by-products from eight coal-fired and one coke-fired steel plants in Scotland.

"The highest yield of dust in the former was only at the rate of 21 tons per annum, as against 300 tons for the latter, and the water-soluble potash averaged 8.86 per cent. The percentage of ash in the tube cleanings varied from 53 to 74 per cent, but these contained a very small percentage of water-soluble potash, the highest being 2.7 per cent."

A record of the proportions of the potash in the charge recovered in the various blast-furnace by-products in case of one plant showed that of the 7.6 lbs. of potash per ton of pig iron charged, 6.04 lbs. per ton were accounted for, 1.4 lbs. in the spent liquor, 1.7 lbs. in the pitch, 0.2 lb. in the tube cleanings, 0.04 lb. in the flue- and stove-dust, and 2.7 lbs. in the slag. The authors estimate that about 1,667 tons of water-soluble potash are recoverable per annum from 102 Scotch furnaces. No estimate is given of the total amount of insoluble potash.

Bracken as a source of potash, R. A. BERRY, G. W. ROBINSON, and E. J. RUSSELL (*Jour. Bd. Agr. [London]*, 25 (1918), No. 1, pp. 1-11).—Numerous analyses of the ash of bracken at various stages of growth and under different conditions are reported. The results show that young bracken yields the purest ash, which contains more than 50 per cent potash. Fully grown bracken yields a less pure ash, of which about one-third is potash. Dried bracken rapidly loses its potash on exposure to the weather, that left out all winter yielding an ash containing only 2 per cent of potash. The fully grown bracken yields more potash per plant and per acre than the young plant. The younger bracken plants contain about 8 per cent of dry matter, the full grown 40 per cent, and the dry shriveled leaves in autumn more than 70 per cent.

The general conclusions reached are that "wherever bracken can be used as litter or bedding it should be done; not only is this a saving of straw but also an enriching of the farm stock of nitrogen, potash, and organic matter. . . . Bracken that for any reason can not be utilized for bedding may well be burned for its ash, provided always that the operation is so carried out that the ash is not exposed to rain at any time. July and August are the best months."

Shall we recommend the use of magnesian limestone? A. G. McCALL (*Proc. Soc. Prom. Agr. Sci.*, 38 (1917), pp. 41-44).—Pot experiments made in a greenhouse are briefly described as conducted at the Maryland Experiment Station to study the response of certain soil types to applications of lime and limestone containing different proportions of calcium and magnesium. A red soil (said to be probably Penn loam) which contained approximately 1.15 per cent magnesium and 0.59 per cent calcium was employed. Applications of limestone, dolomitic limestone, dolomitic sand, hydrated oyster shell, hydrated lime, burned lime, and ground oyster shell were made, the composition of the material ranging from practically pure calcium carbonate in the oyster shell to a calcium magnesium ratio of 3:2 in the dolomitic stone. The pots were seeded to red clover, the stand thinned to 6 plants per pot, and the dry weight of the clover determined after a growth of 114 days. Assuming the yield of the untreated check to be unity, the relative value of the different materials is indicated in tabular form and depicted graphically. Burnt lime with 86 per cent calcium oxid and 14 per cent magnesium oxid was highest with a relative yield of 3.7, while the dolomitic sand and dolomitic stone produced relative yields of only 1.41 and 1.61, respectively.

The results are held to indicate that up to a certain maximum the presence of some magnesium in agricultural lime is beneficial. The fineness of the materials is also deemed an important factor in determining their relative values.

The development of soluble manganese in acid soils as influenced by certain nitrogenous fertilizers, M. J. FUNCHESS (*Alabama Col. Sta. Bul. 201 (1918), pp. 37-78, pls. 12*).—The author describes investigations dealing with the production of soluble manganese in acid soils and its influence upon plant growth. Considerable quantities of soluble manganese accompanied by a high rate of nitrification were found in soils on the station farm which had been fertilized with dried blood and ammonium sulphate. Corn and sorghum failed to make satisfactory growth when planted in these soils in pots in the greenhouse.

The present studies included field observations and pot and tumbler experiments with the soils and their extracts in the greenhouse. For purposes of comparison observations were also made upon soil samples from the ammonium sulphate plats of the Pennsylvania Experiment Station. The data are tabulated and fully discussed. The conclusions reached may be summarized as follows:

Dried blood and ammonium sulphate produced almost complete sterility in two different soils, while lime added to these soils not only prevented injury but promoted a very vigorous plant growth. Soil which had been made highly unproductive by heavy applications of dried blood still supported nitrification under field conditions. The infertility of this soil is attributed to the presence of manganese in the soil solution, rather than to organic toxic bodies. When dried blood is the source of nitrogen, soluble manganese is believed to be due to the action of nitric acid developed by nitrification, but when ammonium sulphate is the source of nitrogen, nitrification is apparently unnecessary in order to increase the amount of soluble manganese in acid soils.

Reduced growth appeared to be due chiefly to the injury to plant roots from the direct action of manganese, rather than to reduced or altered oxidation of soil organic matter. A part of the injury may also be due to the effect of manganese on the foliage, plants with bleached leaves frequently being found in both soil and water cultures when soluble manganese was present.

Relatively large amounts of manganese were recovered from the soil obtained from the Pennsylvania Experiment Station, and water extracts of this soil were highly toxic to seedling plants. When the manganese was precipitated from these extracts they supported a vigorous plant growth.

Apparently, the relative amount of soluble manganese is of more importance, within certain limits, than is the total amount, the presence of considerable amounts of calcium salts in an extract reducing the toxicity of manganese. Precipitation of a part of the manganese by means of bases was much more effective in reducing toxicity than was dilution. Calcium, sodium, and potassium hydroxids were found to be very effective when used in this way.

A large number of acid soils from Alabama contained soluble manganese, after incubation with dried blood or ammonium sulphate. Soluble manganese was not found in any of the basic soils or in any of the acid soils which had been thoroughly limed. The products of sulfonation appeared to be very effective in dissolving manganese in acid soils.

It is believed that these investigations throw light on the conflicting results obtained by different workers who have used manganese as a fertilizer. Manganese salts applied to basic soils are thought to undergo a rapid change, the manganese going out of solution, but when applied to acid soils, the manganese salt would persist as such, and heavy applications would likely cause injury.

A list of 23 titles, comprising the literature cited, is appended.

[Food and fertilizing value of waste cabbage leaves], J. J. O. DE VRIES (*Nederland. Landb. Weekbl.*, 26 (1917), No. 45, Sup., p. 1; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 9 (1918), No. 1, pp. 75-77).—Analyses are reported which show that "(1) the food value of waste cauliflower leaves may be compared to that of brewers' grains, (2) waste leaves of red cabbage have a food value double that of clover hay, and (3) waste leaves of white cabbage have a food value double that of good meadow hay;" and that at present prices "the value of such leaves as a food exceeds their value as a fertilizer."

The percentages of fertilizing constituents in dry matter were found to be as follows: Cauliflower leaves, nitrogen 3.6, phosphoric acid 0.54, potash 1.5, and lime 8.2; red cabbage leaves, nitrogen, 2.8, phosphoric acid 0.58, potash 2, and lime 7.8; and white cabbage leaves, nitrogen 2.6, phosphoric acid 0.67, potash 1.6, and lime 8.6 per cent.

AGRICULTURAL BOTANY.

Winter botany, W. TRELEASE (*Urbana, Ill.: Author, 1918, pp. XL+394, figs. 326*).—This volume supplements the earlier publication of the author (E. S. R., 37, p. 746), and by the use of its keys, illustrations, and brief descriptions it is possible to recognize more than 1,100 species and varieties representing 326 genera of plants in their winter condition. The characters most depended upon are those of the leaf scars, twigs, and buds. The evergreen conifers are not included in this volume, their winter characters not differing essentially from those described in the first volume of this series.

The coefficient of expansion of living tree trunks, C. C. TROWBRIDGE and MABEL WEIL (*Science, n. ser.*, 48 (1918), No. 1240, pp. 348-350).—In continuation of a study begun several years ago and previously partially reported upon (E. S. R., 36, p. 129), the authors give the results of an investigation into the expansion of living trunks of trees during two winter seasons, the observations being made on a European linden tree (*Tilia europæa*) and a plane tree (*Platanus orientalis*), both on the campus of Columbia University. During both winters longitudinal and transverse measurements were made, also an extended series of measurements on changes in the circumference of the tree and on frost cracks during the second winter. The observations of the two winters were practically identical.

It was found that above 32° F. there is a slight increase of transverse measurement with a rise of temperature, while below that temperature the changes are far more marked. As the temperature falls below 32°, a very marked transverse contraction is induced. The coefficient of expansion of the linden above freezing is nearly the same as that of dead wood, while below freezing it is about fifty times as great. The transverse change in the tree below freezing was found usually to lag behind change in temperature of the bark by several hours, often as much as 24 hours. When there is a sudden change in the temperature of the bark, the contraction is rapid but not synchronous.

In the case of longitudinal measurements, it was observed that below the freezing temperature there is a minute but definite increase in length with fall of temperature, and above freezing there is an equally minute increase with rise of temperature. At extremely low temperatures, near 0°, there is a small contraction with a fall of temperature, but when the temperature again rises the expansion is extremely rapid, and by the time the temperature is again the same as before the drop the tree is very much longer than previously.

An extended series of measurements was made on the circumference of the linden tree, and it was found that the expansion and contraction were in the same direction as for the transverse measurements, but this was not always the case. The changes in circumference were found not to be proportional to the transverse measurements. After more than four months, when the temperature was much higher than at the time observations were begun, the circumference of the tree was much smaller than when the first observations were made.

From the measurements on the transverse changes, on the circumference, and on frost cracks, the authors arrive at the conclusion that the frost cracks are caused by a tearing apart of the tissues of the tree due to a great contraction. Both the circumference and the transverse dimensions are much less when the cracks are open than when they are closed, and the one is not proportional to the other. Frost cracks are believed to be due to a difference in the coefficients of radial and tangential contraction of the tree, a difference which sets in at approximately 25°.

Differences in wood of upper and lower sides of branches, P. JACCARD (*Rev. Gén. Bot.*, 29 (1917), No. 344, pp. 225-243, pls. 2).—The factors involved in the production of the dorsiventral differences observed in horizontal branches of deciduous trees are described and discussed as regards their causation and probable bearing.

The relation between degree of stimulation and reaction in geotropic movement, with notes on autotropism, H. LUNDEGÅRDH (*Bot. Notiser*, No. 2 (1918), pp. 65-120, figs. 13).—Details are given of studies on tropisms of the hypocotyl of *Pisum* as related to the duration and intensity of the stimulations. A correlation was found to exist between length of hypocotyl and geotropic effect, inasmuch as a brief stimulation produced in the shorter specimens relatively greater reaction.

Anatomy of the potato plant, with special reference to the ontogeny of the vascular system, E. F. ARTSCHWAGER (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 6, pp. 221-252, pls. 21, figs. 4).—In a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the results are given of an investigation of the anatomy of the potato plant preliminary to a study of the changes brought about by pathological conditions. The author reports a study on the origin, differentiation, and organization of the vascular tissues of the potato, particular attention being given to tuber development. The process of tuber formation as described by Reed (*E. S. R.*, 24, p. 30) has been confirmed and extended by the author, but it is concluded that the pith does not contribute much to the formation of new tissues, it being especially the perimedullary zone which forms most of the tuber. The gross morphology and the anatomy of the different parts of the potato plant are described at considerable length.

Special growth-promoting substances and correlation, C. O. APPLEMAN (*Science*, n. ser., 48 (1918), No. 1239, pp. 319, 320).—From experimental data published elsewhere (*E. S. R.*, 39, p. 524), the author concludes that the potato tuber contains a limited amount of a special growth-promoting substance, and if the amount of tissue surrounding the growing bud is cut too small in preparing tubers for planting there is not enough of this substance available for normal growth. This substance is not believed to have a chemical basis, as is indicated by experiments which showed that if a tuber, before the end of the rest period, is cut into transverse slices the buds on the basal slices will grow out first. If, however, the tuber is cut lengthwise into fractions the growth of basal buds is entirely suppressed. The terminal buds on these fractions do not

produce sprouts until the end of the natural rest period of the whole tuber, which in some cases is a month after the basal buds on the transverse slices have begun growth. The basal buds appear to have a shorter rest period than the terminal buds, but they are unable to grow out until their connection with the terminal end of the tuber is severed. From this it is believed that the terminal end of the tuber, even before its buds have grown out, may inhibit the growth of buds more basally situated.

The author suggests that a physiological disease of potatoes called spindling sprout, which is characterized by the production of long, slender, weak sprouts, may be due to an abnormally low content of growth-promoting substances in the tubers producing such sprouts.

The chemical composition of the plant as further proof of the close relation between antagonism and cell permeability, D. D. WAYNICK (*Univ. Cal. Pubs. Agr. Sci.*, 3 (1918), No. 8, pp. 135-243, pls. 12, figs. 26).—The author has studied the effects of various salt solutions on the chemical constitution of plants, with special reference to a correlation between toxic or antagonistic effects and composition, employing in this work a uniform nutrient solution. The cultures were arranged in series in which the concentration of one salt was constant, while that of a second varied over a wide range. In some series the concentration of the two salt solutions varied, maintaining, however, a constant ratio between the two. The data presented cover the percentages of calcium and magnesium found in plants grown in every culture, with the determinations of potassium, iron, and copper in certain series.

It is stated that the composition of plants grown in different solutions varied widely. Normal growth, approximately that of the controls, was correlated with approximately equal percentages of calcium and magnesium in the plants. Marked decrease of growth was generally correlated with high percentage of these two elements. Absorption rate for any salt seems to be independent of concentration over a wide range. Certain relations are pointed out between the absorption of calcium and magnesium and the presence of iron and zinc salts. Antagonism (as evidenced by growth) is correlated with absorption of the ions. Stimulation accompanied certain concentrations of ferric sulphate or of this compound when accompanied by zinc sulphate. The proportions of the ions were not always the same in tops and in roots. Consideration of the possible effects of changes in concentrations of the various solutions leads to the conclusion that changes in the concentration are secondary in importance to the range of concentrations of the various salts here employed. Apparently growth is constant through widely varying ratios of calcium to magnesium. It is stated that the results in general indicate that antagonistic salt action tends toward the preservation of normal permeability of the plasma membrane in living tissue.

The synergetic action of electrolytes, O. L. RABER (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 12, pp. 682-685, fig. 1).—The author gives results of a study of cases in which a mixture of toxic salts was found to be more harmful than was either constituent, an effect designated by the author as synergy, which was noted in *Laminaria agardhii*. Sodium citrate and sodium chlorid were used together in varying proportions and in combination with other salts, giving data some of which are to appear later. Of all the salts tried, citrates gave the most pronounced synergy.

A comparative study of salt requirements for young and for mature buckwheat plants in solution cultures, J. W. SHIVE and W. H. MARTIN (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 4, pp. 151-175, figs. 3).—The results are given of comparative studies made at the New Jersey Experiment Stations on the

salt requirements of young and mature buckwheat plants grown in nutrient solutions having approximately the same total osmotic concentration but differing in the proportions of the component salts, 36 different sets of proportions of monopotassium phosphate, calcium nitrate, and magnesium sulphate being used. Results are reported as obtained from cultures grown in these solutions to the flowering stage and from the flowering stage to the maturity of the plants.

It was found that the highest yield of buckwheat tops and roots obtained in the four weeks following germination was produced by a solution containing the following salt proportions: Potassium phosphate 0.0144 mol., calcium nitrate 0.0052 mol., and magnesium sulphate 0.0200 mol. For the second 4-week period, which included seed production and ripening, the highest yield of tops and roots was obtained in solutions having the salt proportions, potassium phosphate 0.0108 mol., calcium nitrate 0.0130 mol., and magnesium sulphate 0.0100 mol. This indicates that the maximum yield was produced during the later stage of development in a medium having a lower osmotic proportion of potassium phosphate, a much higher proportion of calcium nitrate, and a much lower one of magnesium sulphate than did the medium which produced the highest yield during the early growth period. The values of the cation atomic ratios magnesium : calcium, magnesium : potassium, and calcium : potassium characterizing the solutions which produced the highest yields, and also those which gave the lowest yields, differed markedly for the two different developmental stages of the plant. The amounts of transpirational water loss during each of the two different periods of development were found to indicate in a general way the yields, high transpiration being correlated in a general way with high yields of tops and low transpiration with low yields. For each of the two developmental periods of growth considered low water requirement was associated with high yields of tops and roots and a high water requirement with low yields. No definite correlation was found between the yields of tops and of seeds, such as exist between yields of tops and of roots.

[The alteration and utilization of solar energy by plants], J. DUFRÉNOY (*Rev. Gén. Sci.*, 29 (1918), No. 5, pp. 132-134).—A brief account is given of the occurrence and the functional relations in plants of anthocyanin, flavone, chromogen, and oxidase; of such processes as reduction and hydration; and of the amounts, forms, and utilization of solar energy, including protection therefrom, with recommendations regarding selection of strains having favorable pigmentation and regarding the use of screens as an aid in the utilization of solar energy.

Some problems of evaporation, H. JEFFREYS (*Phil. Mag. and Jour. Sci.*, 6. ser., 35 (1918), No. 207, pp. 270-280).—The author, considering the main problem of evaporation to be practically one of gaseous diffusion, the equation expressing the variation of concentration of water vapor in the air at any time being identical in form with those that represent the conditions for transference of heat and momentum, discusses the effect of conditions in modifying the factors and results concerned in the movement of water particles to or from stomata. The discussion is limited to the physical aspect of stomatal diffusion. Possible complications are discussed.

On transpiration through leaf stomata, J. LARMOR (*Phil. Mag. and Jour. Sci.*, 6. ser., 35 (1918), No. 208, pp. 350-352).—This is a discussion of some phases of the paper by Jeffreys above noted.

Rapid respiration after death, A. R. C. HAAS (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 12, pp. 688-691).—In a study of *Laminaria* by methods previously noted (E. S. R., 35, p. 821), the author shows that *Laminaria* may respire more

rapidly after death than in its normal condition. This is the case when it has been killed by alcohol, acetone, ethyl bromid, or formaldehyde, or by wounding, drying, or other means.

The influence of illuminating gas and its constituents on certain bacteria and fungi, C. A. LUDWIG (*Amer. Jour. Bot.*, 5 (1918), No. 1, pp. 1-31).—In tests with illuminating gas, methan, ethylene, and carbon monoxid on 13 bacteria and 12 fungi no marked sensitiveness was observed in case of concentrations below 25 per cent. Stronger concentrations, however, checked or stopped growth, sometimes sterilizing a culture completely. Where growth was resumed after exposure to air, it was often apparent that some cells had been killed. Different species show different degrees of tolerance. The species relatively intolerant of one gas is apt to be relatively intolerant of others. Cultivation of a strain in gas appeared to weaken its vigor. The colony habit may be strikingly modified in the more toxic gases. The effect of illuminating gas can not be attributed to any one constituent. It is probably the resultant of several effects plus that of oxygen deficiency. The amount of gas often present in the laboratory is not a menace to cultures of bacteria and fungi. Ethylene and methan are both exceeded in toxic effect by carbon monoxid and illuminating gas, which are about equally toxic.

A bacteriological method useful for the study of other microorganisms, FRED A. BACHMANN (*Amer. Jour. Bot.*, 5 (1918), No. 1, pp. 32-35, figs. 2).—This method as described is claimed to be admirably adapted not only to counting but also to morphological study of single cells, as the colonies are flat and the cell structure is not obscured by anything in a higher or lower plane.

Sterility, auto-inconceptibility, and physiological sexual differentiation, M. J. SIRKS (*Arch. Néerland. Sci. Exact. et Nat.*, Ser. 3 B, 3 (1917), No. 2-3, pp. 205-234).—This is chiefly an analytical and critical discussion of the findings and views of various investigators, with some views of the author on the nature and causes of sterility and inconceptibility as these terms are here defined and employed.

A criticism of the evidence for the mutation theory of de Vries from the behavior of species of *Oenothera* in crosses and in selfed lines, B. M. DAVIS (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 12, pp. 704-710).—This is mainly a discussion of work and results reported by various authors on the forms which have arisen by breeding from *Oe. lamarckiana* and its descendants and the behavior of such forms.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from July 1 to September 30, 1915 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 44* (1918), pp. 71, pls. 11).—This inventory covers the period between July 1 and September 30, 1915, and describes 419 introductions, most of which were secured from correspondents in various parts of the world. A notable collection from Peru, made by O. F. Cook, of this Department, is included.

FIELD CROPS.

[Report of field crops work in British East Africa, 1915-16], H. H. HOLDER, J. JOHNSTON, and C. J. MONSON (*Dept. Agr. Brit. East Africa Ann. Rpt. 1915-16*, pp. 19-23, 35-42, 48-51).—Field tests on the experimental farms at Kibos and Kabete with beans, cotton, peanuts, corn, rice, sugar cane, flax, wheat, potatoes, barley, tobacco, and miscellaneous forage crops are briefly reported, in continuation of work previously noted (*E. S. R.*, 37, p. 734).

[Hawaiian grasses], A. S. HITCHCOCK (*Sci. Mo.*, 5 (1917), No. 4, pp. 323-349; 5, pp. 419-432, figs. 44; *abs. in Nature* [London], 100 (1917), No. 2499, pp. 57,

58).—A botanical trip to the Hawaiian Islands is described, in which mention is made of the more important indigenous and introduced grasses of the islands.

[Culture tests of improved grasses], H. WITTE (*Sveriges Utsädesför. Tidskr.*, 26 (1916), No. 5, pp. 185–194, fig. 1).—These tests were conducted at Svalöf and Lulea with a variety of timothy and one of meadow fescue bred at Lulea, located nearly 700 miles north of Svalöf.

The timothy grown at Svalöf produced a yield 12 per cent below that secured from Swedish commercial seed and 20 and 26 per cent below the yields of Primus and Gloria timothy, respectively. The variety also produced a very small second growth and was largely subject to rust (*Puccinia phleipratensis*). At Lulea this variety of timothy on the basis of 6 crops gave a yield 20 per cent higher than ordinary commercial timothy and also produced a greater yield than was obtained from Primus.

The variety of meadow fescue at Svalöf gave poorer yields than those secured from the variety of timothy. The average yield of 6 crops was only 60 per cent of the yield secured from Danish commercial seed. The meadow fescue also showed only a small second growth and a heavy infection of rust, (*P. coronata*).

Experiments on the influence of the time of cutting on the yield and quality of the hay, K. IVERSEN and R. K. KRISTENSEN (*Tidsskr. Planteavl*, 24 (1917), No. 3, pp. 405–435).—Experiments conducted in eight localities in 1912 and in four localities in 1913 are described and the results reported. Cuttings were made June 7, when orchard grass had headed; June 17, when orchard grass was in bloom and timothy had headed; and June 27, when the grasses had completed the blossoming period.

The average yield of hay from the latest cuttings was larger by about 1 cwt. per töndeland (1.36 acres) than that from the earliest cutting. While early cutting increased the returns from the later cuttings, the increase was not enough to offset the loss sustained in cutting early. The midseason and late cuttings, with the second cutting taken into account, gave about equal results.

The early cuttings were characterized by a proportionately large quantity of orchard grass, while in the late cuttings timothy was the more prominent. The yield of hay increased as the plants progressed in maturity, and during this period the chemical composition changed, the digestibility of the hay was reduced, and the feeding value diminished to a considerable extent. The results of analyses are given in tables.

[Pasture experiments in 1916], N. HANSSON (*K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 5, pp. 413–438, figs. 3; *Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 151 (1917), pp. 28, figs. 3).—The results of several local pasture experiments here reported indicate that in middle Sweden pastures properly managed and under favorable soil and climatic conditions are capable of producing over 3,000 feed units per hectare, the feed unit representing the feeding value of 2.2 lbs. of mixed concentrates. On some of the best of these lands pastured with milk cows 4,147 kg. of milk per hectare (3,690 lbs. per acre) were obtained.

The use of barnyard manure and sulphate of ammonia or nitrate of soda produced a marked increase in the pasturage over the application of only phosphoric acid and potash.

A series of plats was clipped every four weeks to correspond to the time the different paddocks were grazed. It was found that the best aftergrowth was secured in June, July, and August. Later than this period the aftergrowth declined rapidly. The treatment of these plats favored the development of the taller-growing grasses at the expense of those of low growth

and of clover. This effect of repeated clipping was not noticeable the following year. In 1916 clover represented about 20 per cent of the pasture plants and the chemical composition of the herbage was about the same as in the preceding year.

The results of digestion experiments indicated that an average of 78 per cent of the organic matter was utilized by the animals.

[Varieties of wheat and oats], H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr.*, 26 (1916), Nos. 3, pp. 97-108; 6, pp. 219-231, pls. 2).—The description of several new varieties of wheat and one of oats is presented in a series of articles, and the results of comparative tests in which these varieties were included are reported. The varieties of wheat specially considered are Fylgia, Pansar, Svalöf Extra-Squarehead III, Svalöf Sol Wheat II, and Thule II, and of oats, Svalöf Klock III.

The results of experiments at Svalöf showed that Fylgia and Pansar wheat ranked above other varieties in the test in average yield, and also indicated their higher winter resistance. Pansar also gave good results in general field culture in southern Sweden and was characterized by high rust resistance. Extra-Squarehead III grown in a comparative test at Svalöf from 1912 to 1915, inclusive, gave an average yield 2.5 per cent greater than that secured from Extra-Squarehead II, and was also higher in weight per bushel than that variety. Sol Wheat II compared at Svalöf and in a series of local tests with Sol Wheat I and Extra-Squarehead II gave a higher yield than these varieties. Sol Wheat II as compared with Sol Wheat I had a shorter vegetative period, a stiffer straw, and a somewhat higher yielding capacity.

Tests of new winter wheats obtained through hybridization and selection brought out the value of the yielding capacity and winter resistance of Pansar II as compared with other lines of Pansar wheat for southern Sweden and of Thule II as with Thule I for middle Sweden. Thule II is regarded as one of the best varieties with reference to earliness, strength of straw, yielding power, and grain quality thus far obtained.

Svalöf Klock Oats III is described as a new, high-yielding, early variety adapted to the regions of middle Sweden where black oats are grown. The pedigree of the variety is presented and the results of plat and local field tests are reported. It was found that Klock Oats III gave greater yields than Klock Oats II, but that in time of maturity and strength of straw the two varieties were equal. It is believed that Klock Oats III may be substituted with profit for Klock Oats II, but that it should not be grown instead of Great Mogul where this variety, although of late maturity, gives good results. Great Mogul under favorable conditions somewhat outyielded Klock Oats III, besides producing a larger quantity of straw.

Culture tests with root crop strains, 1914-1916, L. HELWEG (*Tidsskr. Planteravl.*, 24 (1917), No. 1, pp. 1-67).—Culture tests were conducted in five localities with strains of Barres field beet and in seven localities with strains of swedes.

Among the strains of Barres field beet Strynø, Tystofte, Pajbjerg, and Ferrikslev, mentioned in the decreasing order of production, ranked highest in average yield of dry matter, the range being from 8,430 to 8,130 kg. per hectare (7,503 to 7,236 lbs. per acre). Strynø also gave the highest yield of beets, 72,500 kg. per hectare (32.26 tons per acre). This strain further ranked high in quality, standing second with 1.8 per cent of branched beets and first with only 1.1 per cent of prematurely seed-producing plants. In conjunction with one other strain it proved to be the most uniform and the easiest to harvest.

The best yielder among the swedes was an Olsgaard strain, which produced an average of 8,380 kg. of dry matter and 71,800 kg. of roots per hectare. In

shape of crown, ease of harvesting, and uniformity this strain also ranked high. The strains designated as Studsgaard and Klank showed the greatest disease resistance.

Alfalfa breeding experiments, P. N. KONSTANTINOV (*Selsk. Khoz. i Læsov.*, 252 (1916), Sept.-Oct., pp. 32-74; Nov.-Dec., pp. 75-124).—This reports rather extensive studies by biometric methods of local strain and of Grimm, Tomsk, French, Turkestan, and German alfalfas, accompanied by considerable tabulated data. The evidence is held to indicate that pure, light coloring, and one-tone dark coloring of alfalfa seeds characterize pure strains, while a greenish or greenish-chocolate color is indicative of hybrid strains.

Some effects of successive cropping to barley, W. F. GERICHKE (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 325-332).—This paper, a contribution from the University of California, discusses some of the effects of continuous cropping to barley on a fertile soil under greenhouse conditions, the successive crops being grown concurrently, in order to eliminate, as far as possible, such environmental factors as climate and season. Tabulated data are presented showing the length of the period of harvest, tillering, height of stalk, weight of grain for the individual heads, and average weight of kernel per head. Certain relationships have been emphasized and discussed as follows: Those showing the different kinds of stalk production and maturation of the crops, those showing the total and average height of the different kinds of stalks of the crops, and those showing the quantity and quality of grain produced as related to the height of stalk in each crop. Pots producing from one to four crops were represented in the series.

In summarizing his observations the author states that "plants of the fourth crop matured with greater uniformity than those of any of the other crops. There were no barren stalks in the plants of the fourth crop. The number of tillers and barren stalks increased with the plants grown in the soil of a lesser number of crops. The total height of all the stalks produced decreased with each successive crop, but the average height of the individual stalks increased with each successive crop. In the fourth and the third crops the heaviest grain, both as to weight per head and as to average weight per kernel, varied with the height of the stalks. The tallest stalks produced the largest heads and the largest average weight per kernel. In the second and first crops no correlation between the height of stalks and weight of grain per head or average weight per kernel was obtained."

Bean growing in Arkansas, W. H. WICKS and C. H. HEARD (*Arkansas Sta. Circ.* 41 (1918), pp. 4).—A brief popular description of methods employed in growing the crop, with notes on diseases and insect pests.

Notes on Canavalia with the descriptions of new species, C. V. PIPER (*Proc. Biol. Soc. Wash.*, 30 (1917), pp. 175-178).—Various species and varieties of Canavalia under test at different places in the Southern States to determine their possible agronomic value are said to include two heretofore undescribed species, *C. campylocarpa* and *C. luzonica*. Certain modifications are noted in regard to the nomenclature of *C. microcarpa* (*C. turgida* and *Lablab microcarpus*) and *C. obtusifolia* (*Dolichos obtusifolius* and *C. lineata*).

Correlations between ear characters and yield in corn, H. H. LOVE and J. B. WENTZ (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 315-322).—This paper, a contribution from Cornell University, presents experimental data on the correlation of seed-ear characters and yield when the seed ears were not selected for extremes in the particular characters studied but were near the average ear type, and is a continuation of earlier work.¹ The characters studied included

¹ Ann. Rpt. Amer. Breeders' Assoc., 7 (1912), pp. 29-40.

length, average circumference, average cob circumference, and weight of ear; number of rows; average weight, average length, and average width of kernels; and percentage of grain. The corn used was Cornell No. 12, a selection from Funk Ninety Day. Tabulated data show the correlations obtained for all the characters for each year of the 5-year period 1910-1914, inclusive, together with the correlations obtained with the same lot of corn in 1909 and 1910.

The average mean percentage of grain in seed ears of a few of the highest classes for the 5 years amounted to 87.596, with a yield of 0.692 lb. per stalk. The average mean percentage in the lowest classes was 81.053 of grain, with a yield of 0.753 lb. per stalk.

It has been concluded that "the characters of length, ratio of tip circumference to butt circumference, average circumference of cob, weight, average weight of kernels, number of rows of kernels, and average length and width of kernels on the seed ears do not show correlations significant enough to be of value in judging seed corn. The data indicate a slight negative correlation between percentage of grain in the seed ear and yield, meaning that possibly ears containing a low percentage of grain yield higher than ears with a high percentage of grain. The average circumference of the seed ear is the only character that shows any significant relation to yield.

"The judge at a corn show or a farmer in selecting his seed corn can not pick the high-yielding seed ears when judging from outward characters of the ears. It is evident that the points emphasized on a score card are of no value for seed-ear purposes and are entirely for show purposes. The only basis left for selecting high-yielding seed corn is the ear-to-row progeny test."

The relation of the vigor of the corn plant to yield, A. E. GRANTHAM (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 340-343).—This paper, a contribution from the Delaware Experiment Station, briefly notes field observations made by the author on the effect upon yield of variations in the size and vigor of corn plants under average field conditions. The corn under observation was planted in hills 42 in. apart each way, with 2 plants to the hill. Of the first 50 hills selected in which there was a marked difference in the size and vigor of the 2 plants the weaker stalk was removed, while in another 50 hills the strong stalk was removed. The heights of the remaining stalks were noted at the time of thinning, and further measurements were made at approximately 8-day intervals from June 25 to September 18 to determine the rate of growth. The date of tasseling was observed, and the weight of ears and yield of dried shelled grain noted.

The maximum difference in the height of the weak and vigorous stalks was obtained on August 5, when the latter came into tassel and amounted to 23.3 in. The average date of tasseling of the weaker plants was August 12. Although the difference in height on June 25 amounted to 95 per cent, on September 18 it was only 9 per cent.

The weight of the ears from the strong plants varied from 277 to 338 gm. and from the weak plants from 60 to 283 gm., the average weight of ears amounting to 309 and 177 gm., respectively. The yield of dried shelled grain was 221.7 gm. for the strong plants and 109.6 gm. for the weak plants, the weight of cob amounting to 41.7 and 38.8 gm., respectively.

The results of these observations are held to indicate that the weaker plants in a population of corn are much below the average in yield, and that, although the stand of plants may be perfect, only an ordinary yield will be obtained. While weak plants may sometimes be the result of environment, it is thought that weakness may also be inherited as a result of a lack of vigor on the part of the kernel. The planting of several kernels to the hill to furnish a wider

opportunity for the selection of strong plants is suggested as a possible means of obtaining a considerable advance in yield through a rigid selection of only the more vigorous plants.

Selection and storage of seed corn, W. L. BURLISON and E. A. WHITE (*Illinois Sta. Circ. 225 (1918), pp. 16, figs. 14*).—In view of the seed corn shortage of 1918, suggestions are made relative to the early selection of seed from the field and to the proper handling of seed corn in order to escape injury from freezing temperatures. Various methods of storing the seed are briefly discussed, and descriptions are given of houses specially designed for the storage of relatively large amounts of seed.

Varieties of cotton, 1917, W. E. AYRES (*Arkansas Sta. Bul. 145 (1918), pp. 39, figs. 2*).—This reports the results of extensive variety tests conducted along the same general lines as those previously noted (E. S. R., 37, p. 642). The experimental work included tests with 74 varieties and strains of cotton grown at Fayetteville and Scotts and cooperatively at Van Buren and Wynne, a test for early maturity with 10 varieties grown at Fayetteville, cooperative tests with 31 common varieties at Russellville and Monticello, and cooperative tests conducted at several points in the State with 15 nonresident and 12 wilt-resistant varieties. The season of 1917 was regarded as a very poor one for cotton. All data are presented in tabular form.

The leading varieties in point of yield of lint in the principal tests were as follows: At Scotts, Cook No. 912 with 475.3 lbs. per acre; at Van Buren, Boykin with 565.6 lbs.; and at Wynne, Dodd Prolific with 332.2 lbs. Descriptive data are submitted for the varieties grown at Fayetteville. In the tests for early maturity Express was first with 231.5 lbs. per acre.

Varieties of cotton. Summary report 1917, W. E. AYRES (*Arkansas Sta. Circ. 39 (1918), pp. 8*).—A summarized report of the variety tests noted above.

Manurial experiments with Sea Island cotton in St. Vincent, with some notes on factors affecting the yield, S. C. HARLAND (*West Indian Bul. 16 (1917), No. 3, pp. 169-202, pls. 10, figs. 3*).—This reports the results of fertilizer experiments with cotton for the period of 1912-1917, and a study of certain other factors affecting yield for the season of 1916-17, namely, the number of flowers opening daily on each plat of the fertilizer series from September 8 to February 14; the number of bolls opening daily on each plat for a period of 53 days followed by pickings at 5-day intervals; a daily examination of about 30 plants to obtain an accurate record of the fate of each bud, flower, and boll produced; and a correlation of daily meteorological observations with crop yield. Considerable tabulated data are presented, together with several charts and plant diagrams illustrating the results obtained.

The results of the fertilizer tests are held to indicate that differences in fertilizer treatment do not cause appreciable differences in the percentages of flowers producing ripe bolls. The highest average yield of seed cotton was obtained from plats-receiving potassium sulphate alone and amounted to 653.4 lbs. per acre, as compared with a yield of 524.4 lbs. from the untreated checks. The next highest yield, 648.6 lbs., was obtained from a mixture of phosphorus, potassium, and cottonseed meal.

In summarizing all results the author concluded that the principal loss in crop yield in St. Vincent was occasioned by shedding, due to heavy rainfall and complicated by fungus and bacterial diseases. June- and July- planted cotton suffered a loss of practically 50 per cent of the crop through bud-shedding, the remaining 50 per cent being subjected to disease attacks rendered especially virulent by the usual heavy rains. Late planted cotton showed little bud-shedding, but considerable loss through internal boll disease. Late plantings (August or September) are deemed an adequate remedy for losses through

bud-shedding, due to heavy rainfall, but could only be recommended when effective legislation was obtained against the food plants of the cotton stainer, *Dysdercus delauneyi*, which is thought to spread the internal boll disease. Furthermore, it is maintained that the cotton varieties have not suffered any inherent deterioration, but that environmental factors are responsible for decreased yields.

[English rye grass], H. WITTE (*Sveriges Utsädesför. Tidskr.*, 26 (1916), No. 5, pp. 195-208, figs. 2).—A brief history of the culture and distribution of English rye grass, *Lolium perenne*, is given, and a comparison of its cultural value with other grasses is reported. Breeding work with the grass at Svalöf is described and a new, improved strain known as Svalöf Victoria rye grass is noted.

At Svalöf, English rye grass gave a yield higher than that obtained from timothy but lower than the yields secured from orchard grass, meadow fescue, French rye grass (*Avena elatior*), and brome grass (*Bromus arvensis*). The second year's crop was smaller than that of each of the grasses mentioned, with the exception of French rye grass, as this is an annual. Varieties of English rye grass known as evergreen, annual, dwarf perennial, and Sutton perennial gave results at Svalöf practically the same as those obtained from the ordinary Swedish commercial variety, but a Norwegian sort proved to be from 10 to 12 days later in maturity, of low growth, and little resistant to rust (*Puccinia coronata lolii*). This variety was found to succeed much better in moist and cool than in dry seasons.

The breeding work at Svalöf showed variations in length, position and quantity of stems, tillering capacity, size of leaves, period of growth, winter resistance, rust resistance, and other characters. It is pointed out that for mixing with early-blooming red clover for conditions prevailing in southern Sweden a rye-grass variety is required which gives high yields from the different cuttings, has the same flowering period as that of the clover, shows high resistance to winter weather and rust attacks, and produces good yields of seed. Svalöf Victoria rye grass is regarded as filling these demands to some extent, as it yields better and matures from 10 to 12 days later than the ordinary English commercial variety, proves winter and rust resistant in southern Sweden, produces a comparatively heavy forage, shows good strength of stem, and is dark green in color.

Hedychium coronarium in Brazil, C. BEADLE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 3 (1917), pp. 104, 105; *abs. in Nature* [London], 100 (1917), No. 2504, p. 152).—On a trip through South America to determine the extent to which *Hedychium* has become established and to study the possibilities of its use for paper making, the author found the plant in small patches in the State of Rio, Brazil, but particularly abundant on the low-lying lands in the State of Parana. The habits of growth of the plant are noted, and the conclusion reached "that a far whiter fiber may be extracted than has hitherto been employed by taking fairly simple precautions."

Wisconsin's hemp industry, A. H. WRIGHT (*Wisconsin Sta. Bul.* 293 (1918), pp. 46, figs. 21).—This bulletin gives an account of the establishment of the hemp industry in the State, 7,000 acres being grown in 1917, and outlines the possibilities for its future development. Field methods employed in growing and harvesting the crop are described, with particular reference to the use of improved harvesting machinery. Yields of fiber are said to average 1,200 lbs. per acre, and the gross returns \$75 per acre.

New Zealand hemp industry, W. H. FERRIS (*Ann. Rpt. Dept. Agr., Indus. and Com., New Zeal.*, 1917, pp. 22, 23).—This briefly reports on the progress of the

industry for the year ended March 31, 1917. The graded output amounted to 149,898 bales, exceeding that of the previous year by 11,623 bales. Tabulated data are presented giving particulars of the gradings during the year.

Report on experiments with early varieties of oats, S. RHODIN (*K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 2, pp. 150-160; *Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 142 (1917), pp. 14).—The results of tests with four varieties of oats conducted for three years beginning with 1913 in two widely separated localities, including one in northern Sweden, are reported. The varieties under test were Orion, Björn (sorts improved at Svalöf), Mesdag, and Nordfinsk. In the southern localities the experiments were conducted on a moist and cool alluvial clay soil and in the northern on a bog soil (a mixture of sand and peaty substances), and the dates of seeding ranged from April 29 to May 6 and from June 4 to 9, respectively.

Even under such widely different climatic and soil conditions Orion gave the highest average yield of both grain and straw. The percentage of hulls in Orion was generally higher than in the other varieties, but in the yield of hulled kernels this variety retained first place. It is believed that under the widely different conditions of the localities the experiments have not been conducted sufficiently long to warrant very definite conclusions.

The effect of different rotation systems and of fertilizers on the protein content of oats, R. W. THATCHER and A. C. ARNY (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 7, pp. 344-348).—This paper, a contribution from the Minnesota Experiment Station, reports observations of the effect upon the protein content of oats of different rotation systems with and without clover and of different fertilizer treatments used in a 3-year rotation of oats, clover, and corn. The protein content was determined for oats grown in rotation from 1914 to 1916, inclusive, and for oats grown with different fertilizers from 1913 to 1916, inclusive. The following summarized table shows the percentage of protein found with the various treatments:

Effect of different rotation systems and fertilizer treatments upon the protein content of oats.

Effect of rotation.			Effect of fertilizers.	
Rotation.	Manure applied.	Average protein content of dry matter. 1914-1916.	Fertilizer used.	Average protein content of dry matter. 1913-1916.
		<i>Per cent.</i>		<i>Per cent.</i>
None, continuous oats....	6 tons per acre each third year.	12.64	None (check plot).....	14.30
2-year, oats and wheat...	6 tons per acre each third year.	12.51	Commercial only.....	15.24
2-year, oats and corn.....	6 tons per acre each third year.	12.78	Manure+commercial.....	15.09
3-year, oats, clover, corn..	None.....	14.71	Manure+nitrate of soda...	15.74
3-year, oats, clover, corn..	6 tons per acre, preceding corn.	14.33	Manure+muriate of potash..	13.40
4-year, wheat, clover, corn, oats.	8 tons per acre, preceding corn.	15.29	Manure+raw rock phosphate.	14.16
5-year, wheat, clover, pasture, corn, oats.	10 tons per acre, preceding corn.	15.14	Manure+acid phosphate..	14.44

Winter storage experiments with potatoes, 1913-1917, L. HELWEG and F. K. RAVN (*Tidsskr. Plantæavl.*, 24 (1917), No. 3, pp. 436-463, figs. 4).—This article reports the results of experiments in storing potatoes in pits and compares them

with earlier results secured in similar work with swedes and field beets. The method of preparing the pits is described and illustrated.

It was found that in pits properly constructed potatoes stored dry as compared with swedes and field beets sustained about the same loss in dry matter during winter storage. As the loss of dry matter during the first part of the storage period was largest in the swedes and smallest in the potatoes, it is recommended that when potatoes are to be used for feeding purposes the swedes be used first, then the field beets, and the potatoes last.

Experiments on the ventilation of the pits did not give conclusive results, but indicated the advisability of ventilation in order to avoid rotting when the tubers must be stored during wet weather. Screening the potatoes for the removal of dirt from the tubers apparently had no influence upon the loss of weight and of dry matter. The greatest loss from the rotting of tubers was due to frost injury and the prevalence of moisture in the pits. It is believed that by means of careful spraying through the period of growth the loss from decay due to disease infection of the stored tubers was reduced to less than 0.5 per cent. The methods employed in ventilating the pits and in placing the thermometers allowed a greater loss than should occur under average conditions in general practice.

The soy bean: Its culture and uses, W. J. MORSE (*U. S. Dept. Agr., Farmers' Bul.* 973 (1918), pp. 32, figs. 14).—This is a rather detailed account of the climatic adaptations, methods of production, and uses of soy beans, with brief descriptions of the more important commercial varieties and of recently improved sorts.

Experiments with different varieties of sugar beets, H. A. B. VESTERGAARD (*Tidsskr. Planteavl.*, 24 (1917), No. 3, pp. 321-356, figs. 2).—The tests reported were conducted at Abed from 1908 to 1915, and at Tystofte from 1913 to 1915. The following varieties and strains were under test at both places from 1913 to 1915: Original Klein Wanzleben Early, Original Klein Wanzleben Late, Strandes, Mette Klein Wanzleben Elite, Russian, and three strains of Klein Wanzleben supplied by the Danish beet sugar factories.

A summary of the data obtained during this period shows the following ranges in average results: Yield of beets, 31,800 to 36,000 kg. per hectare (14.15 to 16.02 tons per acre); sugar content, 18.6 to 19.4 per cent; yield of sugar, 6,110 to 6,750 kg. per hectare; and yield of beet tops, 20,100 to 22,100 kg. per hectare. The number of beets going to seed the first year ranged from 1.3 to 5.6 per cent. The results at Abed indicated a purity coefficient ranging from 89 to 91 per cent. At Tystofte the number of branched or forked beets ranged from 17 to 23 per cent.

Mette Klein Wanzleben Elite and Russian gave the lowest yields of beets and of sugar but ranked high in sugar content. These two varieties also showed the highest percentages of beets going to seed prematurely. The highest yields of beets and of sugar were secured from the two original Klein Wanzleben varieties, but the three strains from the Danish sugar factories representing commercial seed gave nearly as good returns.

Farm practice in growing sugar beets for three districts in Utah and Idaho, 1914 and 1915, L. A. MOORHOUSE, T. H. SUMMERS, R. S. WASHBURN, and J. W. JONES (*U. S. Dept. Agr. Bul.* 693 (1918), pp. 44, figs. 10).—This bulletin presents data obtained in a detailed study of field operations and their related costs in 1914 and 1915 in the production of sugar beets upon 173 farms in three representative areas situated near Provo and Garland, Utah, and Idaho Falls, Idaho. The total costs are based upon the production of 1,461 acres of sugar beets in

the Garland area, 833 acres in the Provo district, and 735 acres in the vicinity of Idaho Falls. The average yields varied from a little more than 13 tons per acre for the Idaho Falls area to about 15 tons for the Provo and Garland districts. Data as to the various cultural operations are summarized in tabular form and fully discussed. The results obtained may be briefly noted as follows:

The most important differences in the field practice employed were found in such operations as manuring, plowing, disking, harrowing with the spring-tooth harrow, cultivating (some using a 1-man-1-horse crew and others a 1-man-2-horse crew), and performing the hand labor (some utilizing the available farm help, while others had this done on a contract basis).

There was a direct relation between the distance the beets were hauled and the cost per ton for marketing.

Labor costs constituted from 54.4 to 58.3 per cent of the total expense of production. This included all man and horse labor as well as the contract labor. The next largest item was interest on investment in land, approximating 23.3 per cent of the total costs in the Garland area, 25.5 per cent at Provo, and 21.1 per cent at Idaho Falls. The total cost of production was \$69.03 per acre, or \$4.65 per ton, for the Garland district; \$69.59 per acre, or \$4.65 per ton, for Provo; and \$62.68 per acre, or \$4.60 per ton, for Idaho Falls. The total credits per acre were \$74.40 at Garland, \$74.20 at Provo, and \$69.46 at Idaho Falls, the estimated value of the beet tops being included in these credits.

In the Garland and Provo areas sugar-beet production proved to be the most important enterprise of the farms under observation, over 40 per cent of the total farm receipts being secured from the sale of sugar beets. At Idaho Falls sugar beets and potatoes were found to be of about equal importance.

The yield per acre is deemed to be an essential factor in reducing the cost per ton and consequently in increasing profits, and any change in the system of farm management that will contribute to increased yield without materially increasing the cost of production should receive the consideration of the grower. A study of the returns on these farms is said to emphasize the fact that a large number of operators did not have a margin of profit after allowance had been made for all expenses connected with the production of the crop, including interest on investment.

A study of the root system of the sugar cane and its application to the production of ratoon crops, C. W. HINES (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 2, pp. 151-161, figs. 7).—This is a general discussion of the vegetative propagation of sugar cane and the development of the root system of cuttings of sugar cane, based on observations begun eight years ago on plantations in Porto Rico, Louisiana, and Mexico and continued at the experiment stations of the Philippine bureau of agriculture and on various plantations throughout the Archipelago and including over 400 varieties of sugar cane. All stages of growth were observed from newly-planted cane to the twelfth ratoon.

Varieties of sugar cane in 1916, W. E. CROSS (*Rev. Indus. y Agr. Tucuman*, 7 (1917), No. 3, pp. 311-325).—This reports a continuation of variety tests with sugar cane, previously noted (E. S. R., 37, p. 139), giving results for 1916 and outlining field work for 1916-17.

Sugar cane varieties tested at the Tucuman experiment station, W. E. CROSS (*Rev. Indus. y Agr. Tucuman*, 7 (1917), No. 11-12, pp. 451-469).—A list of the varieties and strains of sugar cane tested in Tucuman, embodying 131 distinct types and numerous less well-defined strains, with brief notes on the origin and principal characteristics of each.

The identification of varieties of Java and other sugar canes, G. L. FAWCETT (*Rev. Indus. y Agr. Tucuman*, 7 (1917), No. 10, pp. 424-431, figs. 7).—Supplementing work already noted (E. S. R., 37, p. 139), the author presents a scheme of identification for several varieties of sugar cane based on simpler and more conspicuous characteristics than that first proposed.

An annual variety of *Melilotus alba*, H. S. COE (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 8, pp. 380-382).—Seed of *M. alba* obtained in Alabama and planted at Redfield, S. Dak., and Fargo, N. Dak., in 1916, produced plants at both stations approximating 5 per cent of the whole, which flowered abundantly and matured seed in 1916. A careful examination of the plants showed that their botanical characters were practically indistinguishable from those of a second year's growth of *M. alba*. However, the plants which bloomed the first year in every case produced a typical annual taproot with no enlargements at the crowns and with no crown buds. None of these plants survived the winter of 1916-17, whereas only a small percentage of the normal *M. alba* plants winter-killed. Plants grown in the greenhouse from seed from a number of the annual plants produced typical annual taproots comparing favorably with those of the parent plants grown under field conditions.

The plant is described as a new variety and specimens have been placed in the herbarium of the New York Botanic Garden, the National Herbarium, and the Asa Gray Herbarium.

Storage rots of sweet potatoes, J. A. ELLIOTT (*Arkansas Sta. Bul.* 144 (1918), pp. 3-16, figs. 16).—Brief notes are presented on sweet potato losses due to storage rots and means for preventing the losses through the proper handling of the potatoes and the construction of storage houses and bins described, including plans and specifications.

New spring wheat varieties, H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr.*, 27 (1917) No. 2, pp. 51-76, pls. 2).—Comparisons of a number of varieties of spring wheat, including several new sorts, were conducted for a series of years at Svalöf and Ultuna, together with a number of local tests, and the results attained are herewith reported. The new varieties are described, the breeding work with spring wheat at Svalöf is reviewed, and the possibilities of spring-wheat improvement are briefly pointed out.

Svalöf Extra-Club is described as a new hybrid variety adapted to southern Sweden and having the same ripening period as Club, but a higher yielding power. Svalöf Spring-Squarehead is noted as a new hybrid sort suited for fertile soils in southern Sweden and as being more productive than Spring Pearl, one of its parents. In the tests at Svalöf the average yields for several years show that the yield of Svalöf Extra-Club was about 15 per cent and that of Svalöf Spring-Squarehead nearly 10 per cent higher than the yield of Svalöf Club taken as a standard. In straw production these varieties also ranked above Svalöf Club, but not to so great an extent. At Ultuna also Svalöf Extra-Club outranked Svalöf Club and five other varieties in yield.

Hybrid No. 0880, derived from Dala and Club, was tested with reference to its value for middle Sweden. The results showed that the new variety combined the desirable characters of its parents with a greater yielding capacity in 9 tests conducted from 1912 to 1916 in southern and middle Sweden. The average yield of this hybrid was 2,430 kg. per hectare (39.14 bu. per acre), or 9 per cent greater than that of Club, and in 7 tests, including both parents, the average yield was 2,370 kg. per hectare, or 9 per cent above the yield of Dala and about 6 per cent above the yield of Club.

[Winter resistance of wheat varieties], Å. ÅKERMAN and H. JOHANSSON (*Sveriges Utsädesför. Tidskr.*, 27 (1917), No. 2, pp. 77-83; abs. in *Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 9, pp. 1225.

1226).—Plots of different varieties of wheat of known winter resistance were studied to determine a possible relation between chemical composition and the character of resisting low temperatures. Sample plants were taken January 26, 1917, and one and two weeks later. The chemical methods employed are described.

The results indicated a definite relation between winter resistance and the content of reducing substances consisting principally of sugar and being water soluble and not precipitable with mercuric nitrate. The content of these substances decreased consistently with the winter resistance of the varieties studied.

Linked quantitative characters in wheat crosses, G. F. FREEMAN (*Amer. Nat.*, 51 (1917), No. 611, pp. 683-689).—This reports a study of macaroni and bread wheat crosses in an effort to discover whether or not there is a linkage between the shape of head; that is, the ratio of width of head (measured parallel to the face of the head which shows the sinuous furrow formed between the two rows of spikelets), to thickness of head (measured parallel to the array of seeds in the spikelet), and texture (translucency or opaqueness) of grain. Of the two parents the macaroni wheat had a much flattened head and very hard, translucent grains, whereas the bread wheat had a nearly square head with soft, opaque grain.

The parent strains and the F_1 progeny were grown in 1914 and resulted in the ratio W/T of the F_1 plants being much nearer to the macaroni parent both in average and distribution than to the bread wheat parent. Similar observations of the parent strains and the F_2 progeny in 1915, and of the F_3 progeny in 1916, however, showed a uniform correlation between texture of grain and the ratio W/T. Tabulated data show the frequencies and distribution.

The author states that "the question now arises as to whether this correlation is genetic or physiological," and adds "might it not be caused by the simple fact that poorly filled (with starch), hard grains will give rise to a more flattened head than will plump (starchy, soft) grains by failing to fill up and distend the glumes?" The answer to this question is sought in a further analysis of the data presented, and it is concluded that they seem "to indicate that the two characters, hardness of grain and high ratio of width to thickness of head, which entered this cross together in the macaroni parent, tend to come out together in the segregates of the F_2 and F_3 generations, i. e., that there is a genetic linkage between one or more of the factors controlling the grain texture and head shape in the two varieties employed as parents."

The bulk handling of grain on Washington farms, A. HOBSON (*Wash. State Col. Ext. Dept.*, Ser. 1, No. 29 (1917), pp. 20, figs. 9).—This presents a study of the bulk system of handling wheat, made by the State College of Washington in cooperation with the Bureau of Markets of the U. S. Department of Agriculture, and is based on information gathered from 79 farmers in Washington who bulked over 550,000 bu. of grain during the season of 1916. The discussion embraces the methods of cutting the grain, storage on the farm both in portable bins and in permanent farm granaries or elevators, and hauling. Specifications for the construction of portable bins, farm elevators, and bulk wagon boxes are included, together with the estimated cost of each.

[Grain inspection in Illinois, 1915-16], J. P. GIBBONS (*Ann. Rpt. Ill. State Grain Insp. Dept.*, 46 (1916), pp. 288).—This contains the forty-sixth annual report of the Illinois State Grain Inspection Department, the forty-fifth annual report of the Registration Department, the provisions adopted by the State Public Utilities Commission of Illinois regarding warehousing and inspection of grain, and the rules governing the inspection of grain in the State.

A total of 490,020,048 bu. of grain was inspected during the year.

[Grain inspection in Minnesota] (*Ann. Rpt. Chief Insp. Grain, Minn., 1916, pp. 64, fig. 1*).—This includes the thirty-first annual reports of the State Grain Inspection Department and the State Grain Weighing Departments at Minneapolis and Duluth, the eleventh annual report of the Hay and Straw Inspection and Weighing Department, the fifteenth annual report of the Supervising Inspector of Local Warehouses, the fourth annual report from the Grain Testing Laboratory, and the annual report from the Joint Board of Grain Appeals, all of which cover the activities of the various departments for the crop year ended August 31, 1916.

A total of 1,147,438,600 bu. of grain were handled by the grain inspection department during the year.

[Production of root crop and vegetable seeds], H. WITTE (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 2, pp. 115-149, figs. 9*).—This article presents an historical and statistical review of the culture of root crop and vegetable seeds in Sweden, points out the annual domestic requirements, gives directions for the culture of the various crops for seed purposes, discusses the cost of production and the returns, and calls attention to the possibilities and value of this industry for the country.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 2 (1918), No. 2, pp. 8*).—This number contains reports on vegetable seed crop conditions, including statistical data obtained from the War Emergency Vegetable Seed Production Survey of July 1. Incomplete reports of field seed stocks for the United States and Canada, a tabular statement showing the percentage of home-grown seeds planted in truck crops as compared with the amount of seed or plants purchased from dealers, and data on the monthly average timothy seed prices for the period 1913 to 1917, inclusive. In addition, brief notes are presented on the Bermuda onion seed crop; the timothy seed outlook in Iowa, Minnesota, Illinois, and Missouri; the redtop seed situation; seed garden peas in the Northwest; the outlook for Abruzzi rye and Fulghum oats in South Carolina, Georgia, and Alabama; data as to imports of forage plant seeds, etc. Regulations for handling seed wheat and seed rye by seedsmen and grain dealers are also outlined.

HORTICULTURE.

Report of the Horticultural Experiment Station, 1916 and 1917 (*Rpt. Hort. Expt. Sta., Vineland, Ont., 1916-17, pp. 80, figs. 34*).—This comprises a progress report on breeding, fertility, cultural, and miscellaneous experiments with fruits and vegetables conducted at the Vineland Station, Ontario, in 1916 and 1917.

Inspection, certification, and transportation of nursery stock in the United States, New York State, other States, and Canada, 1918, G. G. ARWOOD (*N. Y. Dept. Farms and Markets, Div. Agr. Circ. 172 (1918), pp. 33*).—A brief synopsis of the laws and regulations of the United States, the several States, and Canada, relative to the inspection, certification, and transportation of nursery stock.

A digest of the laws and regulations governing the shipment of nursery stock from New Jersey into other States and Canada, A. S. NICOLAY (*N. J. Dept. Agr. Circ. 19 (1918), pp. 24*).—This circular has been compiled primarily to acquaint New Jersey nurserymen with the laws and regulations governing the interstate shipment of nursery stock.

Sections 304 and 305 of the Agricultural Law (*N. Y. Dept. Agr. Circ., 153 (1917), pp. 7*).—Provisions of the Agricultural Law of New York relating to destructive insect pests, fungus and contagious diseases of trees and plants, inspection and certification of nurseries, and inspection of all nursery stock received in the State are cited.

The spraying service in Niagara County in 1917, L. F. STRICKLAND and N. R. PEER (*N. Y. Dept. Farms and Markets, Div. Agr. Bul. 106 (1918), pp. 147, figs. 37*).—This bulletin describes the organization of a cooperative spraying service in Niagara County, N. Y., and give the results secured in control of pests and diseases among various orchard fruits in 1917.

The spraying service consists essentially in the immediate delivery to all parts of the county of information relative to any outbreak of insect pests and plant diseases which might be anticipated or controlled by prompt attention.

Cultivation of vegetables, F. PETRAZ (*Dept. Agr. Prov. Quebec Bul. 44 (1918), pp. 52, pl. 1, figs. 117*).—A popular treatise on the establishment and care of a vegetable garden, including specific cultural directions for all kinds of vegetables.

The sunflower-artichoke graft, H. COLIN and M^{lle}. Y. TROUARD RIOLE (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 21, pp. 856-858*).—An analytic study of sunflower-artichoke and artichoke-sunflower grafts shows that at whatever level the graft is made, and regardless of which plant is the stock and which is the scion, there exists constantly on either side of the cicatrix a discontinuity in the polarimetric sign of the soluble carbohydrates of the scion and stock. The resulting rotatory power is always positive in the sunflower and negative in the artichoke. The inulin of the artichoke does not penetrate into the sunflower stock or at least is rapidly transformed there. The artichoke stock, fed by a sunflower scion, is able to assert its autonomy in elaborating inulin not only in the tubers but in all levels of the stem below the graft at the expense of the dextrogyrous sugar in the whole plant which is delivered to the stock by the sunflower scion.

Tomato growing in Arkansas, J. R. COOPER (*Arkansas Sta. Circ. 40 (1918), pp. 4*).—This circular contains practical directions for growing tomatoes, including the control of insect pests and diseases.

Catalogue of fruits suitable for cultivation in the Malay Peninsula, J. N. MILSUM (*Agr. Bul. Fed. Malay States, 6 (1918), No. 9, pp. 385-388*).—A large number of fruits believed to be suitable for cultivation in the Malay Peninsula are here listed. The scientific, English, and Malay names, where known, are given for each fruit.

Investigations on apple stocks, B. T. P. BARKER and G. T. SPINKS (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 43-54; Jour. Bath and West and South. Counties Soc., 5. ser., 12 (1917-18), pp. 159-171*).—In continuation of previous notes (*E. S. R., 37, p. 646*), a summary is given of the results secured to date from an investigation of various types of apple stocks that are to be used later in a study of the influence of stock on scion.

The large number of stocks that have been under observation for a number of years are here classified into nine distinct types with reference to the nature of their root systems and described. The standard types are to be propagated and further studied with reference to their effect on scions.

The effect of cross-pollination on size, color, shape, and quality of the apple, W. H. WICKS (*Arkansas Sta. Bul. 143 (1918), pp. [19], pls. 9*).—This paper reports the results of investigations during the three years 1915-1917 relative to the effect of cross-pollination on size, color, shape, and quality of the apple. The Ben Davis, Jonathan, Winesap, and Grimes varieties were used, inasmuch as they were found to bloom at the same time in a previous cross-pollination study (*E. S. R., 37, p. 744*). A résumé is given of some literature discussing the effect of environment and cultural practices upon apple characters, together with a bibliography of cited literature.

As a result of this study the author found that no influence of any variety used as a cross-pollinizer could be detected on size, color, shape, and quality of

the fruit of the female parent. It is concluded that apple growers are justified in planting varieties primarily for the benefit of cross-pollination to secure the normal development of the apple. The greatest mutual affinity was found to exist between varieties crossed as follows: Ben Davis (female) × Grimes, Grimes (female) × Jonathan, Grimes (female) × Ben Davis, Ben Davis (female) × Jonathan.

A review of the work of other investigators taken in connection with observations made during the present study serves to confirm the data secured and shows that variation in apple characters is caused more by various environmental and cultural factors than by cross-pollination.

Preparation of strawberries for market, C. T. MORE and H. E. TRUAX (*U. S. Dept. Agr., Farmers' Bul. 979 (1918), pp. 27, figs. 18*).—This describes efficient methods of preparing strawberries for market. The phases discussed include importance of good handling, the labor problem, picking, grading, commercial strawberry grades recommended, packing, packing sheds, shipping packages, standardization of package, branding and marking, inspection and loading sheds, and loading cars.

"Reversion" of black currants, A. H. LEES (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 33, 34; Jour. Bath. and West and South. Counties Soc., 5. ser., 12 (1917-18), pp. 134, 135*).—A study of a large number of black currant shoots showing various degrees of vigor led the author to observe that strong growing black currant shoots are usually topped by a vegetative terminal bud, whereas weak growing shoots are topped by a terminal flower bud. It was observed that unless the plants were unhealthy one-year and usually two-year shoots nearly always had a vegetative terminal bud. In the third year and in the fourth year the shoot has nearly always a flower bud terminal. It is pointed out that if shoots are allowed to grow for more than three years there is a great tendency for weakened or reverted wood to form, and consequently a decline in fruit production.

The relation between the period of pruning and the growth and production of the vine, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 41, pp. 337-339*).—The author here presents and discusses tabular data secured annually for the period 1905 to 1918, inclusive, showing the effect on yield of pruning grape vines at different times of the year.

The results of the data as a whole show that the time of starting growth, the flowering season, and the maturity season are directly related to the time of pruning. In the cold regions where late spring frosts cause no damage, pruning should be delayed until after the leaves fall in order to assure maturity. Pruning about the time of bud swelling, or after the shoots have grown for an inch or two, tends to retard the growth of the vine, thus protecting it from late spring frosts. At the same time it also retards maturity of the vine. Pruning after the vintage, when the leaves are still green, likewise retards growth in the spring. The greener the shoots are when pruned in the fall the greater will be the period of retardation. Pruning at this time of the year, however, tends to weaken the vines. Strong growing vines may be pruned occasionally early in the fall when the prunings are needed for forage without causing the death of the vines.

The coconut, its culture and uses, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 11 (1918), No. 1, pp. 1-57, 61, pls. 19, figs. 6*).—An account of the coconut with reference to its botany, origin, geographical distribution, varieties, and culture, manufacture of copra, miscellaneous coconut products, and coconut pests and their control. The introduction contains a statistical review of the development of the coconut industry in the Philippine Islands.

Results of tea experiments, experiment station, Peradeniya, 1914-1917, M. K. BAMBER (*Dept. Agr. Ceylon Bul.* 37 (1918), pp. 13).—A progress report on manurial and pruning experiments with tea at the Peradeniya station (E. S. R., 31, p. 837), including considerable tabular data giving details of yields from the various plots during the period 1914-1917. Until 1917 manurial experiments consisted of a cattle manure and green manures. In 1917 a number of commercial fertilizer plots were added to the experiment.

Pecan industry, F. PARK (*Cong. Rec.*, 54 (1917), pt. 6, pp. 106-108).—This comprises the remarks of the author in the House of Representatives, January 6, 1917, in which are presented estimates by the Secretary of Agriculture relative to necessary additions to the appropriations to enable the Department to extend its pecan investigations, together with a memorandum on the pecan industry prepared by C. A. Reed. This memorandum deals with the importance of the pecan, the progress of the industry, and special problems in culture now confronting the pecan growers.

FORESTRY.

Our trees.—How to know them, A. I. EMERSON and C. M. WEED (*Philadelphia and London: J. B. Lippincott Co.*, 1918, 5. ed., pp. XXI+10-295, pl. 1, figs. 148).—A popular guide to the recognition of North American trees at any season of the year, including notes on their characteristics, distribution, and culture. The guide is fully illustrated with photographs from nature.

Tested forest trees for planting in Idaho, F. G. MILLER (*Idaho Sta. Circ.* 5 (1918), pp. 4).—This circular comprises a list of trees for planting in Idaho, offered for sale by the School of Forestry of the University of Idaho. Brief suggestions are also given relative to the selecting of trees, time to plant, planting, care, and cultivation.

Some of the constructional woods of British Guiana, L. S. HOHENKERK and L. P. HODGE (*Timehri, Brit. Guiana*, 3. ser., 5 (1918), pp. 56-61, pls. 2).—Descriptions including weights per cubic foot, moduli of rupture and elasticity, and breaking weights of test bars are given for a number of constructional woods of British Guiana.

Manurial experiments with young rubber at Peradeniya (*Trop. Agr. [Ceylon]*, 50 (1918), No. 6, pp. 327, 328).—Data are given on commercial fertilizer experiments with rubber trees that were begun at the Peradeniya station in 1916. In the results thus far secured, as measured by the girth and height of the trees, the complete fertilizer has been superior to those in which any one of the elements has been omitted.

On the factors which influence the latex flow from *Hevea brasiliensis*, W. H. ARISZ (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 6, pp. 347-360, fig. 1).—An examination was made of the changes of the freezing point depression and of the concentration of the latex obtained at different times and at different positions as well as simultaneously at different positions from the same tree. From the data secured the author arrives at the following hypothesis:

"In many cases, and especially with trees with an abundant flow of latex, the root system is of great moment for the flow of latex. Probably the root system acts as a reservoir which is able to empty itself quickly, and afterwards during the time elapsing before the next tapping is filled again by latex which from all sides gathers in the root system."

On the use of hydrometers (metrolac and latexometer) on rubber estates J. C. HARTJENS (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 5, pp. 256-277; *Meded. Proefstat. Malang*, No. 23 (1918), pp. 23).—This comprises the results of experiments with hydrometers on different rubber estates within the

sphere of the Malang Experimental Station. The results are presented in tabular form and discussed.

The rotation of teak, H. BEEKMAN (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Proefstat. Boschw.*, No. 3 (1918), pp. VIII+74, pls. 12).—An investigation relative to the correct rotation for teak stands, with special reference to conditions in Java. The author's results are presented in a series of tables and are fully discussed. The literature of the subject is also reviewed.

Recent investigations on soil aeration.—II, With special reference to forestry, R. S. HOLE (*Indian Forester*, 44 (1918), No. 5, pp. 202-212, pls. 7).—A review of recent investigations on this subject, with special reference to studies conducted in India.

The economic aspect of Indian silviculture, E. MARSDEN (*Agr. Jour. India, Indian Sci. Cong. No.*, 1918, pp. 29-35, pls. 5).—A paper on this subject read before the Fifth Indian Science Congress, Lahore, 1918.

Afforestation and the partially disabled, T. H. MAWSON (*London: Grant Richards, Ltd.*, 1917, pp. XII+46, figs. 23).—This constitutes the first of a series of booklets in which the author is to describe sites typical of some half dozen classes of settlement suitable for partially disabled soldiers. The site here discussed is considered with special reference to afforestation.

Our National Forests, R. H. D. BOERKER (*New York: The Macmillan Co.*, 1918, pp. LXIX+238, pls. 51).—A popular account of the work of the Forest Service of the U. S. Department of Agriculture on the National Forests.

National Forest areas (*U. S. Dept. Agr., Forest Serv.*, 1918, pp. 8, fig. 1).—A statistical report on National Forest areas, national monuments, national game preserves, and lands acquired in the White and Appalachian Mountains under the Weeks Law to January 1, 1918, accompanied by a map showing the location of the National Forests.

The forest regulations, A. F. FISCHER (*Manila, P. I.: Dept. Agr. and Nat. Resources*, 1917, pp. 25).—This comprises the text of the forest regulations of the Philippine Bureau of Forestry which were issued in accordance with sections 551 and 1817 of the Administrative Code of 1917.

Forest and grass fires in Louisiana, R. D. FORBES (*La. Dept. Conserv. Bul.* 6 (1918), pp. 32, figs. 21).—In this bulletin the author shows the great losses that all classes of people in the State sustain in forest fires and gives a statistical account of the 1917 forest-fire season, together with the text of laws relating to forestry and forest fires.

Wood-using industries of Quebec, R. G. LEWIS and J. A. DOUCET (*Dept. Int. Canada, Forestry Branch Bul.* 63 (1918), pp. 89, figs. 23).—An account of the wood-using industries of Quebec, based upon statistics gathered during the years 1914 and 1915. Detailed descriptions are given of the woods used in the industries, together with descriptions of the various industries and the commodities manufactured from each kind of wood.

DISEASES OF PLANTS.

The parasitic fungi of New Jersey, C. A. SCHWARZE (*New Jersey Stas. Bul.* 313 (1917), pp. 3-226, figs. 1056).—Illustrated descriptions are given of the species of parasitic fungi which are known to occur in New Jersey, studies having been made in the laboratory of all the species included.

Aspergillus fumigatus, *A. nidulans*, *A. terreus* n. sp., and their allies, C. THOM and MARGARET B. CHURCH (*Amer. Jour. Bot.*, 5 (1918), No. 2, pp. 84-104, figs. 3).—Technical descriptions of *A. fumigatus*, *A. nidulans*, and *A. terreus* n. sp. are given in sufficiently broad terms to include the more closely related

of these forms, some of which may eventually be separated off as varieties on physiological grounds.

Disinfection with formaldehyde. A substitute for the permanganate-formalin method, C. G. STORM (*Amer. Jour. Pharm.*, 90 (1918), No. 4, pp. 292-297).—The author, in view of the present high price of potassium permanganate, calls attention to a method of generating formaldehyde which appears to be analogous to the permanganate method, and which is claimed to be as rapid, almost as simple, less expensive, and safer. The new method depends upon the reaction between an aqueous solution of formaldehyde and a soluble chlorate (of potassium or sodium). The supposed reactions are discussed.

A serious eelworm or nematode disease of wheat, L. P. BYARS (*U. S. Dept. Agr., Off. Sec. Circ.* 114 (1918), pp. 5, figs. 6).—The author gives a description of a nematode or eelworm disease of wheat which has recently been found to cause considerable damage in certain parts of the United States, particularly in Virginia. The infection is said to be due to the nematode *Tylenchus tritici*, which, although known to occur in the United States to a slight extent for about ten years, did not become troublesome until 1918, when a loss of 40 per cent due to this cause is reported to have occurred in some fields.

For the control of this disease the author recommends the use of disease-free seed, or when this is not available treatment of the seed for 10 to 20 minutes with water heated to a temperature of 54 to 56° C. (129 to 133° F.), together with crop rotation and general sanitation.

Common diseases of garden vegetables and truck crops, M. T. COOK (*New Jersey Stas. Circ.* 89 (1917), pp. 22, figs. 13).—Brief popular descriptions are given of a number of the more common parasitic and other diseases of garden vegetables and truck crops, with discussions of the value of crop rotation, sanitation, manures and fertilizers, seed-bed treatment and soil sterilization, seed selection and treatment, and spraying.

A hitherto unreported disease of okra, L. L. HARTER (*Jour. Agr. Research* [U. S.], 14 (1918), No. 5, pp. 207-212, pl. 1, figs. 3).—In a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the author describes a disease of okra pods which was first called to notice in 1916. The disease has not been found to affect the leaves under natural conditions, and, while spots similar to those on the pods are sometimes found on the limbs, the damage there is said to be relatively small, the greatest injury being done to the pods. The causal organism, which has been isolated and studied, is technically described as *Ascochyta abelmoschi* n. sp.

The origin of the disease is not definitely known, but it is believed to be carried on seed and may possibly have been introduced on imported seed from Russia, India, or Greece.

Potato stem lesions, H. A. EYSON and M. SHAPOVALOV (*Jour. Agr. Research* [U. S.], 14 (1918), No. 5, pp. 213-220, pls. 3).—Results are given of an investigation conducted by the Bureau of Plant Industry, U. S. Department of Agriculture, on the canker-like lesions occurring on potato stems. A large number of isolations were made in the summers of 1916 and 1917 from material collected in northern Maine, and inoculation tests were made with about 50 strains and species of fungi to determine their ability to infect potato stems. The most serious infection was secured with several strains of *Rhizoctonia solani*, *Fusarium eumartii*, *F. oxysporum*, *F. radicola*, *F. trichothecioides*, *F. discolor*, *Alternaria solani*, *Botrytis* sp. from potato stem, *Sclerotinia* sp. from potato stem, *Acrostalagmus* sp., and *Clonostachys* sp. In addition to the other fungi which are listed, cultures of a number of saprophytic organisms were obtained, species of *Penicillium*, *Phoma*, *Chaetomium*, and other unidentified fungi being repre-

sented, but in no instance was there any evidence of pathogenicity of these organisms.

As a result of their investigations the authors conclude that neither *Rhizoctonia solani* nor any particular species of *Fusarium* can be considered the sole agents responsible for the familiar stem and stolon lesions of the potato. Several parasitic species of *Fusarium*, as well as *Alternaria*, *Botrytis*, *Sclerotinia*, *Zygorhynchus*, *Corethrospis*, *Phoma*, *Clonostachys*, *Acrostalagmus*, and probably other fungi were found capable of causing lesions of potato stems.

The primary development of potato late blight during the growth of the host, J. ERIKSSON (*Rev. Gén. Bot.*, 29 (1917), Nos. 345, pp. 257-260; 346, pp. 305-320; 347, pp. 333-349, pls. 12 figs. 4; 348, pp. 376-380; 30 (1918), Nos. 349, pp. 16-30, fig. 1; 350, pp. 50-61).—The author reviews briefly the whole progress of studies regarding potato late blight (*Phytophthora infestans*) and gives an account of his own studies and observations on this disease.

He states that in field culture the disease appears three or four months after the planting, usually at the time of blooming. In Sweden this is approximately from the middle of July until the first of September, according to weather conditions.

At the time of the primary outbreak, late in summer, the disease is marked by large black spots and a fine grayish inflorescence on the under side of the leaves. These black spots are primary and are independent of each other. Under glass, with the potatoes planted in January, the disease may appear as early as the middle of April, in which case stem and petioles may present a dark gray appearance with partial deformation, other parts also showing characteristic abnormalities.

In the autumnal outbreak the spots show a dark central region, surrounded first by a brown ring, then by a velvety gray zone, and this by one of deep green. In this last region the only indication of disease that is apparent is a difference in the structure of the protoplasm. This shows on strong magnification dark points among the grains of chlorophyll, no trace of mycelium being discoverable in this region.

In the first phases of the disease, the grains of chlorophyll approach the stage of disintegration. At this time the plasma appears to be granular. Later the chlorophyll grains disaggregate. The plasmic mass appears to become more decidedly granular and is also seen to contain nuclei. The blackening at this stage results from the disorganization of the chlorophyll grains.

In a succeeding stage the plasmic granulations aggregate in certain parts of the cells, in particular in the palisade cells, the mass occupying chiefly the internal extremity of the cells. This is the phase of maturation. The evidence is said to indicate that there are now two kinds of protoplasm present, that of the host and that of the parasite. These are intermingled in a state of symbiosis, which, inherited from the mother plant, extends itself in the newly forming cells, the fungus in this stage now constituting what is called by the author a mycoplasma. At a certain period of development of the plant the two organisms begin a contest which is won by the fungus.

The phase of maturation being complete, the plasmic body leaves the cell for the intercellular spaces, where it assumes the form of mycelium, showing there for the first time a filamentous condition. The cell wall is perforated at a point where the granulations are particularly noticeable.

The mycelial filament may develop an oogonium (female element) or an antheridium (male element). If the fungal mass issues at the outer end of the palisade cell it becomes visible as a slender filament between the cell and the epidermis. Inside such a cell at the point of exit can often be seen a vesicle partly or wholly empty. The further development of the filament follows one

of two courses, resulting in either the formation of an oögonium or an antheridium. The conjugation of these elements when mature results in the production of oospores. These may germinate as soon as they are formed, evidently not being in any sense resting bodies, but spores for summer dissemination of the fungus.

These oospores develop, and on reaching the interior of a stoma, give rise to two or three slender branches or filaments which issue from the stoma. As soon as formed the tube produces a spore which may also develop an elongated branching filament, each branch bearing terminal or lateral spores. These spores function in a way analogous to sporangia, their contents differentiating into eight zoospores which are liberated by the splitting of the mother spore and which are able to germinate at once.

The cycle of development here described may be accomplished in about 24 hours. After this period, the most important in the life history of the fungus, the organism extends itself by means of zoospores in a very rapid and destructive manner if the external conditions are favorable.

A bibliography is appended.

Further observations on the cause of the common dry-rot of the potato tuber in the British Isles, G. H. PETHYBRIDGE and H. A. LAFFERTY (*Sci. Proc. Roy. Dublin Soc., n. ser., 15 (1917), No. 21, pp. 193-222, pls. 2*).—The authors have, during the past three or four years, renewed their study regarding the identity of the fungus causing potato dry-rot, ascribed in a former paper (*E. S. R., 20, p. 846*) to *Fusarium solani*. The causal organism, however, is now asserted to be *F. caeruleum*. The two species *F. oxysporum* and *F. trichothecioides*, said to be largely responsible for a somewhat similar rot in parts of America, have not been found in this connection in the British Isles up to the time of this report, though *F. arthrosporioides* and possibly other species of *Fusarium* occasionally cause dry-rot in the British Isles.

F. caeruleum does not produce hadromycosis of the potato plant, nor does it kill the plant by attacking the roots. It can destroy tomato fruits, but does not attack onions, mangels, carrots, parsnips, or apples. Maturity increases susceptibility. Some varieties are measurably resistant. There is no cure for affected tubers. Neither lime nor sulphur is of any value in retarding the rot.

Tomato diseases, J. GIRARDI (*Rev. Min. Indus. Uruguay, 5 (1917), No. 31, pp. 423-428*).—A brief discussion is given of tomato diseases, including *Phytophthora infestans*, *Erysiphe* sp., and *Septoria lycopersici*, and of their effects and control in Uruguay.

Apple spraying experiments in 1916 and 1917, W. J. MORSE (*Maine Sta. Bul. 271 (1918), pp. 101-128*).—This publication constitutes the seventh and eighth annual reports of progress with apple spraying experiments, the earlier experiments having been noted (*E. S. R., 35, p. 752*). In the period covered by the present publication, Ben Davis trees were sprayed. In 1916 applications were made of lime-sulphur and Bordeaux mixture, to which lead arsenate, 1 lb. to 50 gal., was added. In 1917 the treatment was confined to applications of lime-sulphur and various forms of lead arsenate and lime arsenate. The weather conditions in both years, particularly in the early part of the season when infection occurs and the distribution of scab is most rapid, are said to have been extremely favorable for the development of disease.

In 1916 every spray material used showed marked scab control. On the other hand, the efficiency of the spray materials in 1917 was exceedingly low. This is believed to have been due to the abnormal weather conditions of 1917, which delayed the first two applications. Regardless of seasonal conditions, Bordeaux mixture caused much damage both by leaf injury and by fruit russetting, although almost perfect scab control was secured.

In 1916 lime-sulphur combined with lead arsenate gave efficient scab control, but there was also a large amount of russetting. The variety Ben Davis is said to be exceedingly subject to russetting, and with any other variety equally subject to scab and less susceptible to spray injury, there is considered to be abundant evidence that spraying with either fungicide combined with acid lead arsenate will, as a rule, be exceedingly profitable. The experiments reported showed that arsenate of lead alone has considerable fungicidal value, and the same seems to be indicated of lime-sulphur when no arsenical is employed. Tests of dry lime-sulphur showed that it was about as efficient as homemade lime-sulphur of similar concentration.

In comparisons of lime arsenate and lead arsenate, the results of the experiments conducted in both seasons were decidedly in favor of lime arsenate.

The author reports that data are being collected on the effect of spray treatment on the set of fruit.

Brown rot of stone fruits (*Fruit World Austral.*, 19 (1918), No. 4, pp. 85, 86).—It is stated that the abnormal springs of the past two years have considerably increased the development of brown rot of stone fruits (*Sclerotinia cinerea*).

Brown rot in cherries controlled, G. H. CUNNINGHAM (*Jour. Agr. [New Zeal.]*, 16 (1918), No. 1, pp. 38, 39).—The almost complete preservation of the cherry crop in a region of general infection is regarded as the result of a course of spraying with Bordeaux mixture. This was employed just after the leaves fell at a strength of 8:6:40, again just before the buds burst at a strength of 4:4:50, three times at 2:2:50 at ten-day intervals until thrips were observed, and at 10-day intervals thereafter with the mixture last named plus 1 lb. arsenate of lead. This combination spray scorched the leaves of a few trees to which it was applied when the sun was shining.

Common diseases of berries, M. T. COOK (*New Jersey Stat. Circ.* 88 (1917), pp. 12, figs. 7).—Popular descriptions are given of the diseases of blackberries, raspberries, dewberries, gooseberries, currants, strawberries, and cranberries, with suggestions for their control.

Anthracoze [of grape], H. E. LAFFER (*Fruit World Austral.*, 19 (1918), No. 2, pp. 28-30).—This is a somewhat general account of the recent recurrence of black spot of grape, which is now claimed to be the result of infection with *Mangina ampelina* (*Sphaceloma ampelinum*, *Glæosporium ampelophagum*), also of its methods of perpetuation and distribution, of favoring conditions, of varietal susceptibility and resistance, and of control measures.

Black spot [of grape] (*Fruit World Austral.*, 19 (1918), No. 1, p. 7).—In a brief note the history is reviewed of grape black spot, or anthracnose, since its appearance at Mildura in 1894. It is said to have been very widespread recently along the river settlements in Victoria and South Australia. The probable influence of climatic and other conditions is discussed.

Black spot and its control, E. H. HATFIELD (*Fruit World Austral.*, 19 (1918), No. 1, pp. 8, 9).—Along with a general discussion of black spot of grape, the author presents the results of spraying experiments carried out during the last two years. He claims that winter spraying is ineffective, the spray ordinarily most effective being that applied when the clusters are open sufficiently to permit the spray to reach the stems of the fruitlets. The 6:4:50 strength is recommended for use when the clusters are open, the 3:2:50 strength when the petals have fallen.

Cacao spraying experiment, 1916-17, J. B. RORER (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 3, pp. 165-167).—The tabulated results of spraying experiments made on cacao on August 23, September 14, and October 19 with 5:5:50 Bordeaux mixture plus 5.5 oz. blackleaf 40, as here given, are consid-

ered to show that such spraying pays well, even in case of trees that are well cultivated. It is thought that even a single such spraying might be profitable.

Gummosis of citrus plants, M. DE FRANÇA PEREIRA COUTINHO (*Bol. Assoc. Cent. Agr. Portuguesa*, 20 (1918), No. 1, pp. 28-33, fig. 1).—This is a brief account of citrus gummosis in Portugal, where its ravages are said to be great and increasing.

Observations on tulips, II, A. B. STOUT (*Jour. Hort. Soc. N. Y.*, 2 (1918), No. 16, pp. 235-243, pls. 3).—Continuing previous observations (*E. S. R.*, 37, p. 836), a study was made of the development of tulip bulbs during summer with special reference to blindness.

It is stated that during the spring of 1917 *Botrytis parasitica* (*Sclerotium tulipæ*) caused the death of numerous bulbs of tulips of several varieties, all of which had been secured from imported stock. The fungus apparently is able to live in soil containing much humus. A soft rot appears to be connected with the presence of a bacterial organism.

A fungus attack on the deodar, C. G. TREVOR (*Indian Forester*, 44 (1918), No. 3, pp. 130, 131).—Having made a study of the influence of light on the growth and development of the deodar seedling, the author suggests that a fungus attack which is noted may be only a secondary cause of the trouble observed.

The blister rust of the white pines, S. J. RECORD (*Sci. Amer. Sup.*, 84 (1917), No. 2179, pp. 216-218, figs. 11).—This is a brief biological and historical account of the blister rust of five-leaved pines (chiefly *Pinus strobus*, *P. monticola*, and *P. lambertiana*) due to *Peridermium strobi*. Complete eradication of *Ribes*, the host for the alternate form (*Peridermium cronartium ribicola*), and employment of immune pines, such as the native red or Norway pine (*P. resinosa*), are depended upon to control the disease.

The white pine blister rust situation, W. A. McCUBBIN (*Agr. Gaz. Canada*, 5 (1918), No. 4, p. 339).—It is stated that in Ontario diseased pines have been found in but few places, but the currant stage of the blister rust is very widespread, being present in 38 out of the 43 counties in the Province and in these counties occurring in 120 of the 455 townships. The greatest prevalence occurs within a circle of about 60 miles radius, with Toronto as its center, with another generally infected area existing in the Ottawa-Montreal district. In Quebec 8 of 30 counties examined were found to contain the disease. Experimental work is planned to test the practicability of keeping down the currants and gooseberries for some distance around the pines.

Insignis pine disease, D. E. HUTCHINS (*Jour. Agr. [New Zeal.]*, 16 (1918), No. 1, p. 37).—A disease attacking the insignis (Monterey) pine in New Zealand, and apparently favored greatly by the forcing climate and rainfall, is briefly discussed as to its progress in various localities. It is thought that the infection may come from outside the island, as it is worse near the roads. It differs from the *Peridermium* disease attacking these pines in portions of South Australia and New Zealand in that the twigs and, in the second stage, the leading shoots are attacked in the case of *Peridermium*.

The South American Hevea leaf disease, J. B. ROREE (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 3, pp. 128, 129).—Noting a report by Stahel (*E. S. R.*, 38, p. 153), the author states that this disease, caused by a *Scolotrichum*, has probably been present in Trinidad for a number of years. During the last four years it has extended its ravages (at first confined to nursery stock and young trees) to older Hevea trees in both Surinam and Demerara, and was at the time of this statement the most serious trouble of Hevea in this part of the world, though apparently somewhat less serious in Trinidad than in the other areas named.

Spike disease in sandal, P. M. LUSHINGTON (*Indian Forester*, 44 (1918), No. 3, pp. 114-117).—It is stated that on top of the Javadi Hills, at an elevation of 2,800 ft., is an area of spiked sandal supposedly dating back to the spring of 1916. The only clue yet found to the origin of the disease is the number of other species similarly affected which form a chain to the plains forest. Healthy sandal trees are found to have living attachments on spiked *Zizyphus ænoplia*, and numerous dead haustoria and scars are to be found on the attacked *Zizyphus*.

Note on *Polyporus lucidus* and its effect on the wood of the willow, P. A. VAN DER BIJL (*So. African Jour. Sci.*, 13 (1917), No. 10, pp. 506-515, pls. 6, figs. 4).—The author gives a discussion of the occurrence, synonymy, and relations of *P. lucidus*, with an account of its hosts, and in particular the pathological anatomy of *Salix* when infected with this fungus, which appears to be very common on *Acacia mollissima*, the cultivated wattle. The action of the fungus (which is said to be usually a facultative parasite) on the wood is described as a gradual digestion. Control measures are limited to the destruction of the sporophores and of all material harboring the mycelium of the fungus.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Audubon, the naturalist, F. H. HERRICK (*New York and London: D. Appleton & Co.*, 1917, vols. 1, pp. XL+451, pls. 34, figs. 14; 2, pp. XIII+494, pls. 23, figs. 12).—This history of the life and time of Jean Jacques Fougère Audubon (1785-1851), the noted American ornithologist and author of *The Birds of America* (1827-1838), includes (vol. 2, pp. 401-456) an annotated bibliography of his published writings, biographies, etc.

Five new mammals from Arizona and Colorado, E. A. GOLDMAN (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 21-26).

A new subspecies of chipmunk from the Yellowstone National Park, V. BAILEY (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 31, 32).

The house sparrow and the brown rat in the prairie Provinces of Canada, N. CRIDDLE (*Agr. Gaz. Canada*, 5 (1918), No. 4, pp. 348, 349).—A brief note, relating particularly to the occurrence of the English sparrow (*Passer domesticus*) and the brown rat (*Epimys norvegicus*) in Manitoba, calls attention to the ways in which they can be controlled.

It is pointed out that in the prairie Provinces the house sparrow requires more heat than is supplied by mere shelter in order to survive during the cold winter nights and can be controlled by eliminating any such source. The control of the brown rat, which has only recently invaded Manitoba, is much more difficult. Since these rodents congregate in the warmer buildings during winter, a concentration of attention in control work to those places is advisable.

Notes on the subspecies of *Numenius americanus*, H. C. OBERHOLSER (*Auk*, 35 (1918), No. 2, pp. 188-195).—These notes relate to subspecies of the curlew, *N. americanus americanus*, one of the shore birds that has greatly decreased during the last decade, and *N. americanus occidentalis*.

The migration of North American birds, I-III, H. C. OBERHOLSER (*Bird-Lore*, 19 (1917), No. 6, pp. 320-330, pl. 1; 20 (1918), Nos. 1, pp. 16-19, pl. 1; 2, pp. 145-152, pl. 1).—The first paper presents records on the migration of the cliff swallow (*Petrochelidon lunifrons*), tree swallow (*Iridoprocne bicolor*), violet-green swallow (*Tachycineta thalassina*), bank swallow (*Riparia riparia*), and rough-winged swallow (*Stelgidopteryx serripennis*); the second paper on the scarlet tanager (*Piranga erythromelas*) and the Louisiana (or western) tanager (*P. ludovicina*); and the third paper on the summer tanager

(*P. rubra*), hepatic tanager (*P. hepatica*), purple martin (*Progne subis*), western martin (*P. subis hesperia*), Cuban martin (*P. cryptoleuca*), gray-breasted martin (*P. chalybea*), barn swallow (*Hirundo erythrogastris*), and the European chimney swallow (*H. rustica*).

Mutanda ornithologica, III, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 47-50).

A check-list of North American amphibians and reptiles, L. STEJNEGER and T. BARBOUR (*Cambridge: Harvard Univ. Press*, 1917, pp. IV+125; rev. in *Science*, n. ser., 47 (1918), No. 1218, pp. 440-442).—In the preparation of this check-list the authors have followed the lines of the A. O. U. check-list of birds (E. S. R., 24, p. 555), thus including the species and subspecies which they deem valid and of certain occurrence in North America north of the Rio Grande and in Lower California, Mex.

The genera and higher groups are in systematic sequence, the species are in alphabetical order, and no attempt is made to give synonyms. The names are followed by citations of their original appearance except in the case of such family names as are formed automatically. The reference to the original description is followed in the case of genera by the type species, in the case of species by a reference to the first appearance of the name in the combination adopted. Miller's list of North American land mammals¹ is said to have also been a valuable guide. References to Cope's works² are added. The type localities and the range of the species or subspecies, so far as it is possible to determine, are given. The review is by A. G. Ruthven.

A mollusk injurious to garden vegetables, F. C. BAKER (*Science*, n. ser., 43 (1916), No. 1100, p. 136).—The small slug *Agriolimax agrestis* is reported to have been a source of injury to garden vegetables in western New York during the summer of 1916. At Canandaigua holes were eaten into potato tubers and the full pods of string beans were eaten into and the beans consumed. Injury to potatoes was also observed at Rochester, and at Syracuse this slug was found in cauliflower in company with the smaller black slug *A. campestris*. Lettuce was also injured.

A molluscan garden pest, F. C. BAKER (*Science*, n. ser., 47 (1918), No. 1216, pp. 391, 392).—In continuation of observations of *Agriolimax agrestis*, noted above, it is stated that this pest again did considerable damage to cauliflower, lettuce, and potatoes in western New York during the summer and early fall of 1917. At Brewerton, N. Y., it was observed eating cabbage and potatoes and appears to have been a source of considerable damage in the district including Rochester, Canandaigua, and Geneva.

It is stated that injury by it can be controlled, when the depredations are confined to the surface plants, by spreading fine ashes about the plants. For those individuals that enter the ground and attack the tuber below the surface, it is suggested that if the grass surrounding the garden in which the slugs hide during the day be kept short it will prevent the slugs from hiding near the garden, and if boards are placed about the garden to serve as traps the slugs may be collected from beneath them during the day and killed.

Methods of asexual and parthenogenetic reproduction in cestodes, T. SOUTHWELL and BAINI PRASHAD (*Jour. Parasitology*, 4 (1918), No. 3, pp. 122-129, figs. 13).—The authors here discuss the following methods of asexual and partheno-

¹G. S. Miller, jr., List of North American Land Mammals in the U. S. National Museum, 1911 (U. S. Nat. Mus. Bul. 79 (1912), pp. 455).

²E. D. Cope, The Crocodilians, Lizards, and Snakes of North America (Rpt. U. S. Nat. Mus., 1893, pp. 153-1270, pls. 36); The Batrachia of North America (U. S. Nat. Mus. Bul. 34 (1889), pp. 525, pls. 86, figs. 119).

genetic reproduction among the cestodes: (1) Internal proliferation from the wall of the cysticeroid, as seen in *Polycercus*, *Coenurus*, and others; (2) endogenous budding, as seen in Willey's *Merocercus*; (3) external budding, as exemplified in Haswell and Hill's species of *Polycercus*, *Staphylocystis*, etc.; and (4) parthenogenetic reproduction in *Ilisia parthenogenetica*, an adult tape-worm of doubtful affinities.

Entomological notes on the Surrey Pine District, B. W. ADKIN (*Quart. Jour. Forestry*, 11 (1917), Nos. 2, pp. 81-88; 3, pp. 149-160; 4, pp. 217-237; 12 (1918), No. 2, pp. 80-98).—The third of the four papers presents notes on certain insects of the families Hymenoptera, Coleoptera, Lepidoptera, and Hemiptera attacking conifers and their occurrence in the Surrey Pine District. The list of Lepidoptera is said to be approximately complete; the list of and notes on the Aphididae (pp. 232-235) were compiled by F. V. Theobald.

A brief account of the most important agricultural pests of Uganda, C. G. GOWDEY (*Kampala, Uganda: Mengo Planters, Ltd.*, 1917, pp. 132, pl. 1).—The several parts of this work relate to boring beetles of economic importance; a descriptive catalogue of scale insects, together with recommendations for their control; termites; insect pests of cacao; and insect pests of coffee. Plant and general indexes are included.

[Report of the] entomological branch, W. W. FROGGATT (*Rpt. Dept. Agr. N. S. Wales*, 1917, pp. 30-33).—A brief report of the work of the year.

Studies on the insect enemies of cacao and other cultivated plants on the island of Sao Thomé, A. F. DE SEABRA (*Mem. Soc. Portugaise Sci. Nat.*, 3 (1917), No. 1, pp. 28, pl. 1, figs. 24).—The following papers are included: Some Observations on Scale Insects Attacking the Leaves of Cacao (pp. 3-13); The Occurrence of *Lecanium viride* and *Cephalosporium lecanium* in Sao Thomé (pp. 13-15); Note on *Aspidiotus articulatus* and *A. palmæ* (pp. 16-18); Some Observations on *L. nigrum* (pp. 19-21); On the Occurrence of *Orthesia insignis* in Sao Thomé (pp. 22-24); and Some Observations on *Neoterme gestroi* and *Microcero-terme parvus theobromæ* (pp. 24-28).

Light traps as a means of controlling insect pests, N. CRIDDLE (*Canad. Ent.*, 50 (1918), No. 3, pp. 73-76).—This discussion includes a table which records the captures for August and September, extending over a period of three years and ended with 1917.

Spraying formulas for garden insects, A. L. MELANDER (*Wash. State Col. Ext. Dept.*, Ser. 1, No. 35 (1918), pp. 16, figs. 10).—This brings together practical information for ready reference.

An ecological study of the May fly Chironetetes, W. A. CLEMENS (*Univ. Toronto Studies, Biol. Ser.*, No. 17 (1917), pp. 43, pls. 5, figs. 5).—A report of studies of *C. albomanicatus* made in the vicinity of Ithaca, N. Y.

The control of grasshoppers in New York State, G. W. HERRICK and C. H. HADLEY, JR. (*N. Y. State Col. Agr., Cornell Ext. Bul.* 4 (1916), pp. 71-79, figs. 8).—A popular summary of measures applicable in grasshopper control.

The egg-laying habits of some of the Acrididae (Orthoptera), N. CRIDDLE (*Canad. Ent.*, 50 (1918), No. 5, pp. 145-151).—Notes are given on the oviposition of a number of species of Orthoptera in Manitoba, including five species of CEdipodinae (*Arphia pseudonietana*, *Camnula pellucida*, *Dissosteira carolina*, *Spharagemon collare*, and *S. bolli*) and four species of Locustinae (*Melanoplus atlantis*, *M. angustipennis*, *M. packardii*, and *M. bivittatus*).

The value of *Coccobacillus acridiorum* in the destruction of locusts, B. BARBARA (*An. Soc. Rural Argentina*, 51 (1917), No. 5, pp. 385-387).—A summary of recent work with this organism in the control of locusts, accompanied by a list of 15 references to the literature.

Studies on the harlequin bug, F. B. PADDOCK (*Texas Sta. Bul.* 227 (1918), pp. 7-65, pls. 5, figs. 4).—This is a detailed report of studies of the biology of the harlequin cabbage bug, including a bibliography of five pages. Much of the data is presented in tabular form.

The harlequin cabbage bug is found over the entire State of Texas, being injurious to many garden and truck crops, including cabbage, cauliflower, collard, mustard, and turnip. "The egg stage of the spring brood was found to be 11.2 days, of the summer brood 5.2 days, of the fall brood 1.01 days. The period of maturity of the spring brood was 46.3 days, of the summer brood 30.9 days, of the fall brood 35.6 days. The length of the adult life of the spring brood was 91.5 days, of the summer brood 87.7 days, and of the overwintering brood 171 days. At College Station there are three complete generations of the harlequin bug in a year, with a partial fourth brood. There was an average mortality of hibernating bugs at College Station of 22 per cent. There were no parasites or predacious enemies observed that are of economic importance. Artificial control must be used against this pest. Such measures as fall destruction, winter treatment, spring destruction, and clean culture must be used. Remedial measures consist of hand picking and spraying."

The genus *Corythucha* (Tingidae; Heteroptera), E. H. GIBSON (*Trans. Amer. Ent. Soc.*, 44 (1918), No. 1, pp. 69-104).—Of the 57 species of *Corythucha* here recognized, 21 are described as new to science.

The genus *Hadronema* (Miridae; Heteroptera), E. H. GIBSON (*Canad. Ent.*, 50 (1918), No. 3, pp. 81-84).—The author recognizes seven species of flower bugs of this genus, of which two are described as new.

Control of plant lice in the vegetable garden, H. D. BROWN (*Illinois Sta. Circ.* 227 (1918), pp. 4, fig. 1).—A popular summary of information.

Eastern aphids: A few species of *Prociphilus*, EDITH M. PATCH (*Maine Sta. Bul.* 270 (1918), pp. 45-100, pls. 2).—After calling attention to the fact that the complete American food cycle has been ascertained for but two of the species of *Prociphilus* found in New England, namely, *P. tessellata* and *P. venafuscus*, the author presents brief notes on several species (pp. 45, 46). A fall migrant of a species found in 1912 congregating in enormous numbers about the base of mountain ash at Orono, Me., is apparently *P. fitchii* of Baker and Davidson. A root species common on certain Compositae in Maine is thought to be *P. (Trama) erigeronensis* and to be the root form of a species present in spring upon other vegetation from which it migrates—possibly hawthorn or Juneberry.

The greater part of the bulletin is taken up by part 5 of the food plant catalogue of the Aphidæ of the world (E. S. R., 31, p. 157).

Are there different races of vine phylloxera? B. GRASSI and M. TOPP (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), I, No. 5, pp. 265-273; abs. in *Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 9, pp. 1322-1327).—The experiments of Börner led the authors to undertake the investigations here reported with a view to determining the different ways in which the phylloxera spreads in Italy.

Aphis saliceti, *Siphocoryne pastinacæ*, and allied species, C. P. GILLETTE and L. C. BRAGG (*Canad. Ent.*, 50 (1918), No. 3, pp. 89-94, figs. 20).—This paper gives the results of the authors' studies of six species of aphids that are quite similar in general appearance. One, *Aphis theobaldi*, from celery at Webster, Mass., and on *Heracleum* sp. flower heads at Geneva, N. Y., is described as new, and a new name, *Siphocoryne essigi*, is given to a previously described species, *Hyadaphis pastinacæ*.

New Aphididæ from California, A. F. SWAIN (*Trans. Amer. Ent. Soc.*, 44 (1918), No. 1, pp. 1-23, pls. 2).—Nine species of California aphids are described as new to science, several of which appear to be of economic importance.

Report on progress of trench fever investigations, R. P. STRONG ET AL. (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 22, pp. 1597-1599).—This is a report of experimental work by the trench fever commission of the medical research committee of the American Red Cross conducted at a stationary hospital in France in which tests were made upon 68 of numerous Americans who volunteered.

The results have shown the disease to be caused by an organism, which has not thus far been shown to be filterable, in the blood and particularly in the plasma. While the disease can be produced by injection of blood or by louse (*Pediculus corporis*) infection, it appears that the infection is transmitted naturally by the louse and apparently this is the important and common means of transmission.

"Thirty-four men have been employed in the blood inoculation experiments, and these have been inoculated either with blood or some constituent element of it taken from trench-fever cases in the febrile stage of the disease. Of these, 23 have developed typical trench fever. Sixteen of these were inoculated with whole blood, of which number 15 have developed the disease. . . .

"In relation to transmission of the disease by the louse *P. corporis*, 26 men have been subjected to experiment. Of these, 22 have harbored lice which have bitten trench-fever patients in the febrile stages of the disease, and the remainder have harbored, for the same period of time, normal, uninfected lice which have not bitten trench-fever patients. . . . So far, 12 of the individuals who have harbored the infected lice in this manner have contracted the disease. The time which elapsed from the date when the lice were first placed on these individuals to the date of the beginning of the disease has been: One case, 16 days; one case, 17 days; two cases, 19 days; one case, 20 days; two cases, 21 days; one case, 25 days; three cases, 26 days. [Subsequently there were also two additional cases, one of 30 days and one of 35 days.] . . . The disease produced by inoculation of the blood or by the louse infection is apparently the same. . . . The investigations and experiments have also demonstrated that trench fever is a specific disease and is not a form of typhoid fever."

Studies of muscoid larvæ entoparasitic in arthropods, I-II, J. C. NIELSEN (*Vidensk. Meddel. Dansk Naturhist. For. i Kjöbenhavn*, 63 (1911), 1-26, pl. 1, figs. 19; 64 (1912), pp. 215-248, figs. 41).—Accounts are presented in the first paper on the biology of *Carcelia gnava* reared from *Stilpnotia salicis* and *Malacosoma neustria*, *Exorista blepharipoda* from the caterpillars of (*Acronycta*) *Apatela psi* and *A. tridens*, *Meigenia floralis* from larvæ of the chrysomelid beetle *Gastrophysa viridula*, and *Actia pilipennis* from the European pine shoot moth (*Retinia*) *Evetria buoliana*.

The second paper records the rearing of the larvæ of the first generation of *Phryxe vulgaris* from caterpillars of *Cheimatobia brumata*, *Hibernia defoliaria*, and *Drybota protea*; and those of the second generation from (*Orgyia*) *Hemerocampa antiqua*, *Eremobia ochroleuca*, and *Eupithecia innotata*; *Tachina larvarum* from *Zygana filipendulæ*; *T. impotens* from caterpillars of *H. antiqua*; *T. macrocera* from caterpillars of *Dasychira groenlandica* and *Malacosoma castrensis*; *T. vidua* from the caterpillar of *Macrothylacia rubi*; and *Digono-chæta setipennis* from an undetermined caterpillar and in numbers from full-grown earwigs (*Forficula auricularia*). About 50 per cent of *S. salicis* on willows was parasitized by *C. gnavi* in 1909, and in 1910 but few caterpillars were seen.

Studies of muscoid larvæ entoparasitic in arthropods, VI, J. C. NIELSEN (*Vidensk. Meddel. Dansk Naturhist. For. i Kjöbenhavn*, 68 (1917), pp. 23-36, figs. 20).—This paper includes accounts of *Panzeria minor* n. sp., parasitic in the caterpillars of *Tæniocampa pulverulenta* and *Calymnia trapezina*; *Winthemia quadripustulata* reared from caterpillars of *Vanessa io*, *V. urticae*, *Cucullia lychnitidis*, and *Brotolomia meticulosa*; *Frivaldskia distincta* reared from caterpillars of *Drepana falcatoria*, *Ematurga atomaria*, *Cabera fusaria*, *C. exanthemata*, *Cidaria corylata*, *Tephroclysis indigata*, and *Sphinx pinastri*; *Campylocheta obscura* parasitic in the caterpillars of *Crocallis elingvaria*; *Tachina rustica* reared from the larvæ of an undetermined sawfly feeding on clover; and *Goniocera enigmatica* parasitic in *Malacosoma castrensis*.

The pathological effects of *Phthirus pubis*, G. H. F. NUTTALL (*Parsitology*, 10 (1918), No. 3, pp. 375-382).—The author considers the pathological effects of *P. pubis* under the headings of general effects of parasitism, experimental observations on the effects of Phthirus bites, and melanism.

Parthenogenesis in silkworms, A. LÉCAILLON (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 5, pp. 192-194; abs. in *Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 10, p. 1392).—A report of further studies (*E. S. R.*, 36, p. 459) during 1916 and 1917 on the change in color which occurs normally in certain unfertilized eggs of *Bombyx mori*, and on the formation in this species of larvæ of parthenogenetic origin.

Parthenogenesis in the silkworm, A. LÉCAILLON (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 23, pp. 799-801).—In continuation of work noted above the author finds that diverse races or varieties of *Bombyx* differ in their liability to parthenogenetic development.

The alfalfa looper (*Autographa californica*), A. GIBSON (*Agr. Gaz. Canada*, 5 (1918), No. 2, pp. 132-136, figs. 2).—An account of the life history and habits and morphology of this lepidopteran, which is widespread in distribution in western North America, occurring in Canada in the Provinces of British Columbia, Yukon, Alberta, and Manitoba. The caterpillars occurred in Canada in numbers sufficient to cause serious injury to crops in 1914 for the first time. Studies of the species in Washington State by Hyslop have been previously noted (*E. S. R.*, 28, p. 253).

The pink bollworm in Brazil, E. C. GREEN (*A Lagartia Rosada dos Capulhos no Brazil. Rio de Janeiro: Soc. Nac. Agr.*, 1917, pp. 23, figs. 13).—Noted from another source (*E. S. R.*, 38, p. 562).

The bud moth (*Agr. Gaz. Canada*, 5 (1918), No. 2, p. 155).—Experiments conducted by the department of biology of Macdonald College are said to have shown that two sprayings with arsenate of lead before blossoming time were quite effective in controlling the eye-spotted bud moth. This insect is probably more destructive to the apple than is the codling moth in western Quebec.

Control of cabbage worms, H. D. BROWN (*Illinois Sta. Circ.* 226 (1918), pp. 4).—A popular account of the imported cabbage worm and cabbage looper and means for their control.

On the occurrence of a cephaline gregarine, *Leidyana tinei* n. sp., in lepidopterous larvæ, D. KEILIN (*Parasitology*, 10 (1918), No. 3, pp. 406-410, pl. 1, fig. 1).—The gregarine here described lives in larvæ of the elachistid moth *Endrosis fenestrella*, found in the nests of the house martin (*Chelidon urbica*).

Vegetable powder as a larvicide in the fight against mosquitoes.—A preliminary note, J. K. THIBAUT, JR. (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 17, pp. 1215, 1216).—In investigations as an agent of the Bureau of Entomology of the U. S. Department of Agriculture the author has found that a powder made from dried weeds and grasses when spread quickly and evenly over the surface

of water is very effective for killing such well-known species of mosquitoes as *Anopheles quadrimaculatus*, *Culex quinquefasciatus*, *C. abominator*, *Aedes columbianae*, and *Psorophora cyaneescens*. "Of these the species with short, thick air tubes such as *Anopheles*, *Aedes*, and *Psorophora* are easily killed, while the species of *Culex* with very long, slender tubes are more resistant, *C. abominator* being the most resistant species I have had to deal with."

A trematode parasite of anopheline mosquitoes, M. B. SOPARKAR (*Indian Jour. Med. Research*, 5 (1918), No. 3, pp. 512-515).—In the note by Sinton (E. S. R., 38, p. 562) on a trematode parasite of anopheline mosquitoes the author recognizes a resemblance to similar encysted trematodes which he has found on the fins of certain fresh-water fish as well as in the bodies of snails, chiefly *Planorbis exustus*. The author's observations have shown that these parasites are the encysted forms of certain cercaria which are widely distributed in ponds and puddles in the suburbs of Bombay, being derived from *P. exustus*. Of 7,194 of these snails examined 1,422, or approximately 20 per cent, were found infested by them. In tests made he has found it possible to infest *Anopheles* and to a less extent *Culex* mosquitoes with the encysted parasite, but it apparently does not undergo any development in the mosquito. "Sinton's observations meanwhile have added one more link to the rather complicated life history of this parasite, and it is interesting to note that the encysted forms should be found in mosquitoes and their larvæ, while further development takes place in certain fish which are known to be mosquito destroyers."

The western newt or water-dog (*Notophthalmus torosus*), a natural enemy of mosquitoes, A. C. CHANDLER (*Oregon Sta. Bul.* 152 (1918), pp. 3-24, figs. 6).—Casual observations of this salamander, indicating that it might be an important factor in the control of mosquitoes in the Willamette Valley, Oreg., led to the series of observations and experiments here reported.

A general account is first given of its life history and habits, based largely upon studies by Ritter reported in 1897.¹ It is pointed out that the habits of the species change with the season. The adults are entirely aquatic during the greater part of the year, living in lakes, reservoirs, slow-flowing streams or sloughs, or any other quiet body of water of sufficient size. In October or November in the vicinity of Corvallis they leave the water and wander about on land, being commonly found crawling about in dead leaves in patches of woods. In November or December they retreat to cavities under stumps, logs, or stones, where they curl up to spend the cold portion of the winter, sometimes a dozen or more together, and on warm days come forth and wander about in search of food. In the vicinity of Corvallis the males return to water and assume the breeding characteristics as early as January 1, whereas the females can seldom be found in water before February.

The author's studies deal particularly with the food habits, which are considered under the headings of field observations, stomach examinations, and experimental feeding. The experiments show that a single water-dog may consume more than 200 large mosquito larvæ in the course of 24 hours. Many additional larvæ appear to be killed by the salamanders, which, after the stomach is filled, often seize and chew the larvæ without swallowing them. One individual observed destroyed nearly 400 mosquito larvæ and pupæ within 24 hours. It is pointed out that in spite of the great capacity for food, particularly of the adults, water-dogs are able to go for weeks or even months without food and show no apparent discomfort from this fasting. In the experiments conducted the only kind of food which was definitely given preference over mosquitoes was tadpoles and larval salamanders.

¹Proc. Cal. Acad. Sci., 3. ser., Zool., 1 (1897), pp. 73-114.

The study has led the author to suggest the extensive use of water-dogs as mosquito destroyers in rain barrels, water barrels on trestles, etc.; water troughs; borrow pits, blocked swamps, etc.; reservoirs, mill ponds, garden pools, etc.; irrigation ditches; and rice marshes.

A list is given of 8 references to the literature.

Some bloodsucking flies of Saskatchewan, A. E. CAMERON (*Agr. Gaz. Canada*, 5 (1918), No. 6, pp. 556-561, figs. 6; *Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 5, pp. 632-638).—This is a report of a preliminary survey of the bloodsucking flies, including the *Culicidæ*, *Simuliidæ*, and *Tabanidæ*, affecting live stock and man, made within a radius of 50 miles of Saskatoon during 1917.

Studies on the screw worm fly, *Chrysomya macellaria*, in Panama, L. H. DUNN (*Jour. Parasitology*, 4 (1918), No. 3, pp. 111-121).—The screw worm is found in great abundance throughout the Canal Zone and Panama and is of considerable economic importance. The author discusses its attack on man and animals, emergence of larvæ when buried in the ground, transmission of disease by it, breeding out larvæ from cases of myiasis, and preventive and control measures.

Phytomyza flavicornis, a dipteran injurious to the Milan cabbage in Lombardy, C. DEL VECCHIO (*Natura [Milan]*, 8 (1917), Jan.-Apr., pp. 75-77, figs. 2; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, p. 1069).—A large proportion of Milan cabbage in a big plantation was found, in September, 1915, to have been injured by attacks of this dipteran (*P. flavicornis*).

A partial key to species of the genus *Agromyza*, J. R. MALLOCH (*Canad. Ent.*, 50 (1918), Nos. 3, pp. 76-80; 4, pp. 130-132).—The author divides the genus *Agromyza* into arbitrary groups and gives a key with each. Four species are described as new to science.

Seventeenth annual report of the Illinois State Beekeepers' Association, compiled by J. A. STONE (*Ann. Rpt. Ill. Bee Keepers' Assoc.*, 17 (1918), pp. 124, figs. 13).—The proceedings of the association are presented.

The control of European foulbrood, E. F. PHILLIPS (*U. S. Dept. Agr., Farmers' Bul.* 975 (1918), pp. 16, fig. 1).—A popular account of European foulbrood with preventive and remedial measures.

Pollination of alfalfa by bees of the genus *Megachile*, F. W. L. SLADEN (*Agr. Gaz. Canada*, 5 (1918), No. 2, pp. 125, 126, figs. 4).—The author reports the finding, both at Redcliff and Lethbridge, Alberta, of a leaf-cutter bee (*Megachile latimanus*) which visits fields of alfalfa in bloom in considerable numbers, tripping the flowers at a rate of 17 flowers per minute. This species was more numerous in the alfalfa fields than five other species of *Megachile* together, all of which perform the same service. Several species of bumblebees, fairly plentiful, worked more slowly and often failed to trip the flowers. Honeybees, also plentiful, visited the flowers without tripping them. Similar observations were made at Summerland and Keremeos, B. C., but *M. perihirta* was the abundant species.

Two important introduced parasites of the brown-tail moth, C. F. W. MUESEBECK (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 5, pp. 191-206, pls. 4).—The present paper deals with studies by the Bureau of Entomology of the U. S. Department of Agriculture of the bionomics of *Apanteles lacteicolor* and *Meteorus versicolor*, both of which are widely distributed in Europe and have spread rapidly in this country since their introduction, having been recovered from practically the entire brown-tail moth area.

A. lacteicolor, which hibernates in young caterpillars of the brown-tail moth, was described by Viereck in 1911 from material reared at Melrose Highlands,

Mass., having apparently been undescribed prior to that time, although a widespread and general parasite of the brown-tail moth caterpillars in Europe.

The female oviposits in first and second stage brown-tail moth caterpillars during the month of August, when a single female may attack upward of 300 caterpillars. The larva hatches out in about 3 days and feeds slightly on the fat and lymph there, merely keeping pace with the very slow development of the caterpillar prior to hibernation. Dissections have shown that when *A. lacteicolor* enters into competition with either or both of the two other parasitic species that pass the winter in the same host, namely, a tachinid, *Zygobothria nidicola* and *M. versicolor*, its competitors are killed before midwinter. On the resumption of the feeding by the host in the spring the small larvæ of *A. lacteicolor* become active and begin in earnest the task of destroying their hosts. The death of the host occurs in from 7 to 12 days after they have begun feeding, just prior to the issuance of the parasite. The cocoon of this parasite is completed in 3 hours or more following issuance from the host, pupation taking place in about 48 hours after the larva has ceased spinning. The total length of the period spent in the cocoon is from 5 to 8 days.

In investigations of the summer hosts of this parasite, the author found that the gipsy moth is the only one acceptable to *A. lacteicolor*, which is available at the time of the appearance of the adult parasites of the first generation. These gipsy moth caterpillars are attacked in the first or second stage and are killed by the parasite before they have passed the third. In the case of the summer generations development from egg to adult averages from 19 to 20 days, the adults emerging during the last weeks of June and in early July. After emergence from the gipsy moth caterpillar, between which date and the time of oviposition in the hibernating caterpillars of the brown-tail moth there is a period of more than one month, several other lepidopterous hosts are parasitized by *A. lacteicolor*, of which *Apatela hasta*, a noctuid not uncommon upon wild black cherry, is said to be the most important. It is considered an admirable host for tiding *A. lacteicolor* over the period elapsing before the brown-tail moth caterpillars that are to carry the parasite over the winter become available. The economic importance of this parasite is considerable, as high as 20 to 25 per cent of the brown-tail moth larvæ of a web being parasitized. Mention is made of several hyperparasites.

M. versicolor, described by Wesmael in 1835, is much similar in habits to *A. lacteicolor*. The larva feeds very slightly in the fall, increasing scarcely at all in size, and passes the winter in the first stage within the body cavity of its host. When the brown-tail moth caterpillars begin feeding in the spring the larvæ of *M. versicolor* also become active, the cocoons appearing in from 10 to 14 days. The period from the issuance from the host to emergence from the cocoon is 7 to 9 days, while the pupal period alone is 4 to 6 days. The adults of the first generation emerge during the first two or three weeks of June. Mention is made of a number of summer hosts. In New England the adult parasites of the first generation evidently prefer the last two stages of the brown-tail moth caterpillars for oviposition. It is said that there is unquestionably a partial third generation on various native hosts. As a parasite of the hibernating brown-tail moth caterpillars *M. versicolor* is much inferior to *A. lacteicolor*, destroying on the whole only a small percentage of them.

An interesting new hymenopterous parasite, A. B. GAHAN (*Canad. Ent.*, 50 (1918), No. 5, pp. 151, 152).—Under the name *Aphelopus theliæ* the author describes a new bethylid of the subfamily Dryininæ parasitic on *Thelia bimaculata* at Cold Spring Harbor, N. Y.

Ichneumonoid parasites of the Philippines, II, C. F. BAKER (*Philippine Jour. Sci.*, Sect. D, 12 (1917), No. 6, pp. 383-422).—The present paper (E. S. R., 39,

p. 468), dealing with the genus *Rhogas* [Rhogadiniæ (Braconidæ)], includes descriptions of 17 species new to science and the new subgenus *Aleirhogas*.

Parasitic Hymenoptera from the British Solomon Islands, collected by Dr. W. M. Mann, C. T. BRUES (*Bul. Mus. Compar. Zool.*, 62 (1918), No. 3, pp. 97-130, pl. 1).—This paper includes descriptions of 21 species new to science.

Prospaltella berlesei against *Diaspis pentagona*.—Observations in Piedmont during 1916, P. VOGLINO (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 1066, 1067).—A report upon studies of *P. berlesei* in Piedmont in 1916.

Lectotypes of the species of Hymenoptera (except Apoidea) described by Abbé Provancher, A. B. GAHAN and S. A. ROHWER (*Canad. Ent.*, 49 (1917), Nos. 9, pp. 298-308; 10, pp. 331-336; 11, pp. 391-400; 12, pp. 427-433; 50 (1918), Nos. 1, pp. 28-33; 3, pp. 101-106; 4, pp. 133-137; 5, pp. 166-171; 6, pp. 196-201).

Some ladybird beetles destructive to plant lice, W. A. ROSS (*Agr. Gaz. Canada*, 5 (1919), No. 4, pp. 344-347, figs. 2).—These notes relate to the morphology and biology of several of the 25 species of lady beetles collected in the Niagara district of Ontario, namely, *Adalia bipunctata*, *Coccinella 9-notata*, *C. 5-notata*, *C. trifasciata*, *Hippodamia 13-punctata*, *H. convergens*, *Megilla maculata*, and *Anatis 15-punctata*.

Oryctes rhinoceros in the Philippines, D. B. MACKIE (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 315-334, pls. 3).—This is a report of studies of the rhinoceros beetle, particularly of its life history and bionomics and its control.

Coeliodes fuliginosus, a coleopteran injurious to the poppy in Austria, R. RANNINGER (*Ztschr. Angew. Ent.*, 3 (1916), No. 3, pp. 383-387; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 1068, 1069).—Injury to poppies observed in late May and early June, in which numerous plants in a plantation of poppies had turned yellow and subsequently died, was found to be due to *C. fuliginosus*. The larva of this beetle attacks the roots and hollows out either round holes or open galleries 1 to 1.5 mm. in depth, it generally being found in the upper half of the root, sometimes down to a depth of 8 cm. (about 3 in.) beneath the soil. Examination by the author showed 60 per cent of the plants to harbor one larva, 38 per cent 2, and 2 per cent 3 larvæ.

The round-headed apple-tree borer, *Saperda candida*, G. G. BECKER (*Arkansas Sta. Bul.* 146 (1918), pp. 3-33, pl. 1, figs. 69).—This is a report of studies of the biology and control of the round-headed apple-tree borer conducted in the Ozark fruit district in Arkansas.

The species was found to have a 2-year life cycle in the Ozarks. Under normal conditions the eggs require about two weeks for incubation. The larvæ attain their full growth by the end of the second season; the number of larval instars vary, but there may be at least six. Pupation was found to begin the latter part of March and may continue up until the middle of June, but most of the larvæ pupate in April. The pupal stage lasts from 12 days to 6 weeks, requiring an average of 3 weeks. The adults remain in the tree for about 10 days after transformation, during which time they may feed to some extent in the pupal cell. Adults attain sexual maturity about 10 days after emerging.

"Beetles feed extensively upon the bark of twigs, on the ribs of leaves, and even on the fruit during the time that they are at large in the orchard. This suggests poisoning as a means of control. Females normally deposit their eggs in the trunks of apple trees within about 0.5 in. of the ground. Eggs may be deposited higher up on the trunk and, under caged conditions, have also been deposited in twigs and in the fruit. Our limited data suggest that an average female may deposit from 40 to 50 eggs, though we had one beetle deposit 93.

Beetles apparently do not discriminate between healthy and sickly trees when depositing eggs. Beetles apparently do not manifest any preference as between the different varieties of apples when depositing eggs. Beetles prefer to deposit eggs in trees between the ages of 3 and 10 years. The duration of the adult stage ranges from 1 to 2 months. Borers are worse in neglected orchards. Borers are worse in orchards set out on recently cleared land.

"A test of various tree protectors gave best results with an asphaltum-linseed oil combination which could be applied at a temperature of about 115° C. [239° F.]. The temperature of melted asphaltum may cause severe injury to young trees and consequently should not be applied to trees under 4 years of age. If the reddish castings found above the ground, at the base of some of the infested trees, are used as a guide for pointing out infested trees, 80 per cent of the latter are likely to be overlooked.

"As a result of investigations reported in this bulletin our recommendations for the control of this insect are (1) worming the trees in early August (for the Ozarks) and in April; (2) spraying young trees with a view to poisoning the adults, and (3) the protection of trees which are a few rods from a source of infestation with an asphaltum-linseed oil combination which can be applied at a temperature of not over 115°."

Recent investigations of this pest by Brooks have been previously noted (E. S. R., 33, p. 360). A bibliography of ten pages, prepared by E. H. Dusham, is appended.

A new *Hoplia* from Florida, W. S. FISHER (*Canad. Ent.*, 50 (1918), No. 4, pp. 140-142).

The bean weevils, T. J. HEADLEE (*New Jersey Stat. Circ.* 91 (1917), pp. 3-6, figs. 4).—A popular account of the bean weevil, cowpea weevil, four-spotted bean weevil (*Bruchus quadrimaculatus*), and European bean weevil (*B. rufimanus*) with control measures.

Synopsis of British Strepsiptera of the genera *Stylops* and *Halictoxenus*, R. C. L. PERKINS (*Ent. Mo. Mag.*, 3. ser., 54 (1918), Nos. 39, pp. 67-72; 40, pp. 73-76, pl. 1).—Eleven species of *Stylops* and 3 of *Halictoxenus* are recognized from Great Britain, of which 5 of the former and 2 of the latter are described as new to science. A table for the separation of the males of the genus *Stylops* is included.

Gall insects and their relations to plants, E. P. FELT (*Sci. Mo.*, 6 (1918), No. 6, pp. 509-525, figs. 34).—A general account.

Cheese mites, NELLIE B. EALES (*Jour. Bd. Agr. [London]*, 24 (1918), No. 10, pp. 1087-1096, pl. 1).—A summary of information on four species of mites that attack cheese, namely, the Cheddar mite (*Carpoglyphus anonymus*), and the Stilton and Cheddar mites (*Tyroglyphus siro*, *T. longior*, and *Aleurobius farinæ*).

Observations and experiments conducted with a view to ascertaining the manner in which new cheeses become infected in a cheese room previously attacked. how mites spread from cheese to cheese and from shelf to shelf, the effect of natural conditions on mite attack, and to find some substance that will exterminate the mites on an attacked cheese are reported. It was found that brushing attacked cheeses daily and removing the mite dust considerably lessens the seriousness of the attack. "Fumigating the cheese room with carbon bisulphid in the proportion of 1 lb. of bisulphid to every 500 cu. ft. of space during August or September will keep the mites under control, though it is unlikely that it will succeed in exterminating them. There should be at least two fumigations, the second about 12 to 14 days after the first. A third fumigation after the same interval is advisable. Painting the surface of the cheeses with the bisulphid is the only way of getting rid of the mites altogether. Three such paintings at intervals as above are necessary."

FOODS—HUMAN NUTRITION.

Nutritive factors in animal tissues, I, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 309-323, figs. 5).—The products of animal and vegetable origin which have been found to contain either the fat-soluble or water-soluble vitamin have been tabulated with references to the original literature, and the results of further investigations as to the occurrence of the water-soluble factor in certain animal products are reported. Beef muscle, meat extract, the tissue residue from this meat extract, and dried pig liver were investigated by the authors, following the plan of their earlier studies with rats.

The results of the nutrition experiments show that both the meat powder and the meat residue seem to be deficient in the water-soluble food hormone, although both are suitable as sources of protein in the diet when the other essential ingredients are present in sufficient amounts. The meat extract was found to contain at least a small amount, and the dried pig liver a large amount, of the water-soluble vitamin as well as adequate protein.

It is pointed out that the results parallel the findings of Cooper (E. S. R., 31, p. 762) in respect to the relative antineuritic properties of muscle and liver, and agree with those of Eddy (E. S. R., 36, p. 160) on the growth-promoting properties of the water-soluble extract of the pancreas. The adequacy of both the meat powder and the meat residue as sources of protein is emphasized in view of the fact that meat residues after the preparation of soups from muscle tissue are often discarded as inferior food products.

Nutritive factors in plant tissues.—I, The protein factor in the seeds of cereals, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 521-535, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1657; *Jour. Soc. Chem. Indus.*, 37 (1918), No. 17, p. 526 A).—The authors point out that in feeding experiments no adequate comparison between the value of different proteins can be made unless the quantity of protein actually eaten is known. To determine the relative value of the total protein in some of the commonly used cereals, feeding experiments were conducted with rats, the protein of the diet being supplied by protein concentrates from the cereal under investigation prepared by removing the starch by the action of diastase. Concentrates of rice, barley, corn, and wheat were tested.

The preliminary results which are reported offer evidence that "the total proteins of rice and barley, in contrast with maize and oats, when furnished in diets containing 16 to 17 per cent of protein, supply enough of all the amino acids essential for growth." It is stated, however, that the experiments reported indicate that it ought to be possible to make an animal grow on a diet in which the maize kernel is the sole source of protein, provided a preparation of the total proteins could be obtained which would permit feeding them in sufficient quantity so that enough of those amino acids which are present in certain of the proteins and not in others would be available to meet the minimum nutritive requirements of the organism.

It was found that the amino acid deficiencies of the protein concentrate of oats could be supplemented by casein or gelatin, the former proving the more satisfactory.

A biological analysis of pellagra-producing diets.—II, The minimum requirements of the two unidentified dietary factors for maintenance as contrasted with growth, E. V. MCCOLLUM and NINA SIMMONDS (*Jour. Biol. Chem.*, 32 (1917), No. 2, pp. 181-193, pls. 3, figs. 3).—Continuing the study of pellagra-producing diet (E. S. R., 39, p. 266), the authors report the results of a series of experiments designed to show the magnitude of the interval between the require-

ments of young rats for fat-soluble A and water-soluble B for maintenance, as contrasted with growth, and also a series of tests with full-grown rats for the purpose of comparing the maintenance requirement of adult with that of young tissues. From the experimental data the following conclusions are drawn:

There is no low plane of intake of either fat-soluble A or water-soluble B which can be said to maintain an animal without loss of vitality. More than the minimal amount necessary for the prevention of loss in weight must be used if the diet is continued for any length of time. Within certain limits growth is proportional to the supply of both factors, all other factors being properly adjusted. A low intake of either factor can be tolerated much better with an otherwise excellent diet than with one which is less well constituted. An attempt to fast an individual selectively for one or both of these dietary essentials is a dangerous procedure.

The authors assert that efforts directed toward the control of tumor growth by eliminating growth factors from the diet can never become of practical value, as the life of the host will be cut short if the experimental conditions imposed are sufficiently rigid to render growth impossible.

A biological analysis of pellagra-producing diets.—III, The values of some seed proteins for maintenance, E. V. McCOLLUM and NINA SIMMONDS (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 347-368, figs. 13).—Continuing the above investigation, the authors have studied the relative value of the total protein of certain seeds by means of biological studies with rats, using a diet adequate in respect to every factor except protein, which was supplied by the seed under investigation. In one case a pure carbohydrate was added to produce a low protein mixture, in another the mixture was fed without any carbohydrate addition, and in a third the mixture was fed with a protein preparation from the seed employed so as to raise the protein level.

It was found in all cases that the vitality of the animals was greatly lowered by a diet otherwise adequate but near the physiological minimum in its protein content. From single seeds the plane of protein intake necessary for maintenance of body weight in grown or nearly grown rats when all other dietary factors were properly adjusted was found to vary from 4 to 6 per cent in the case of millet, oat, wheat, maize, rice, flax, and cotton seeds to about 11 per cent in the navy bean and pea. Millet seed and oat seed proteins appeared to be better than the other seed proteins. The nitrogen of the alfalfa leaf when fed as the sole source of protein showed no superiority over the seed proteins.

In the application of this data to the interpretation of the dietary factors operating to produce pellagra the authors call attention to the diet employed by Goldberger and Wheeler (*E. S. R.*, 34, p. 258) for the production of experimental pellagra in which the protein consumption was not far from 8 per cent of the food mixture. This protein, derived almost wholly from seeds, is considered too low to support normal growth and close to the point where the resistant power of the adult will be decreased.

In conclusion the authors state that "there is in reality no quantity of protein, fat-soluble A, or other constituent of the diet which can be designated as the physiological minimum, without the biological values of every other dietary factor being also stated. The least amount of butter fat which will suffice to support growth when the diet is otherwise of good constitution will not be adequate in another case in which the quality of one or another factor is of a low order. This idea should be kept clearly in mind in interpreting the etiology of pellagra, in cases where several dietary factors fall below the optimum."

The dietary qualities of barley, H. STEENBOCK, HAZEL E. KENT, and E. G. GROSS (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 61-74, figs. 20; *abs. in Chem.*

Abs., 12 (1918), No. 19, p. 2000).—The dietary qualities of barley were studied by means of feeding experiments with rats.

It was found that barley alone is unable to meet the demand of the growing animal. It is deficient in inorganic salts and in the fat-soluble vitamin but contains an abundance of the water-soluble vitamin. The protein content (13.6 per cent) proved to be too low for continued growth at the normal rate.

The authors conclude that "the primary growth determinant in barley is inorganic salts. Of secondary importance, but no less urgent, are protein and fat-soluble vitamin."

The use of soy bean as food, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 369-387, figs. 5).—The authors have studied the nutritive possibilities of various soy bean products, using white rats as the experimental animals. Variations in the apparent nutritive value of raw and cooked soy bean meal indicate that there is nothing toxic in the raw meal, but that cooking the meal tends to make it more palatable. The different results obtained with the commercial soy bean flours are likewise attributed to unlike methods of heating in their preparation. The properly cooked soy bean was found to contain proteins adequate for promoting normal growth, an adequate supply of the water-soluble vitamin, and some of the fat-soluble vitamin. It is deficient in its mineral constituents, being relatively poor in calcium and chlorine.

The authors consider that the facts that the soy bean is the only seed hitherto investigated, with the possible exception of flax and millet, which contains both the water-soluble and fat-soluble vitamins and that its protein is of high physiological value lend a unique significance to its use as a food.

The value of the yeast vitamin fraction as a supplement to a rice diet, A. D. EMMETT and L. H. MCKIM (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 409-419, figs. 4).—This is a report of the first of a series of investigations dealing with the efficiency of the vitamins from autolyzed brewers' yeast as adjuvants to a diet that has been shown to be deficient in some particular vitamin. Pigeons were fed on polished rice until polyneuritis developed. They were then treated with the Seidell autolyzed yeast vitamin and after recovery were fed a diet consisting of one of the following: Polished rice with vitamin, shelled corn, brown or natural rice, brown rice with vitamin, barley, unhulled oats, and hulled oats.

A study of the different reagents used to adsorb the vitamin fraction from autolyzed yeast led to the conclusion that ordinary fullers' earth ground to a definite fineness is as satisfactory as Lloyd's reagent, but that the kieselguhrs do not adsorb the yeast vitamin. The effect of the dietary treatments and the authors' conclusions are summarized as follows:

"The activated fullers' earth when given as a rational supplement to a polished or a brown rice diet acts as a partial stimulant to increase the weight of the treated polyneuritic pigeons. It does not, however, in the case of the polished rice, accelerate the increase in weight to anything like that which is produced under similar conditions with brown rice alone, corn, barley, or hulled oats, and, comparatively speaking, this activated yeast vitamin is not a complete supplement to a polished rice diet.

"There are apparently two so-called vitamins associated with rice polishing, one which cures polyneuritis and one which produces weight, and of these two, the Seidell yeast vitamin preparation contains chiefly the curative fraction along with a small percentage of the other.

"Finally, it is evident that while this activated yeast vitamin product is a valuable adjuvant to the diet in the case of convalescents from avian polyneuritis, yet, for the best results, the diet should, in addition, be made up in part at least of vitamin-containing foods, not for the purpose of preventing the

recurrence of typical attacks of this dietary deficiency disease (for the preparation is able to do this) but with the object of bringing about normal gains in weight and complete recovery."

Food accessory factors (vitamins) in bacterial culture, with especial reference to hemophilic bacilli, I, D. J. DAVIS (*Jour. Infect. Diseases*, 21 (1917), No. 4, pp. 392-403; *abs. in Abs. Bact.*, 2 (1918), No. 2, p. 59).—The author discusses the following characteristics of hemoglobin in relation to the growth of hemophilic bacteria: (1) Hemoglobin is essential for their growth, (2) it is sufficient in high dilution, (3) alone it will not support growth, other proteins being necessary for continued development, and (4) it does not lose its power of supporting growth through prolonged heating at the boiling point or even higher.

Attention is called to the close correspondence between these characteristics and the properties and mode of action of the food accessory factor, water-soluble B. The fact that a much greater growth of hemophilic bacteria takes place when fresh animal or plant tissue is added to the medium or another organism is allowed to grow on the same plate suggests the similarity of the tissue factor to fat-soluble A.

The author concludes that the activity of the food accessory substances in animals and in higher plants may concern, or in some way control, the metabolism of certain elements like iron, phosphorus, calcium, or iodine, as well as, possibly, the protein metabolism.

Food accessory factors (vitamins) in bacterial culture, II, D. J. DAVIS (*Jour. Infect. Diseases*, 23 (1918), No. 3, pp. 248-251).—The study noted above has been extended to include the problem of finding substances which might enhance the growth of other than hemophilic bacteria. The organisms used were *Bacillus coli*, *B. typhosus*, *B. diphtheriae*, *Streptococcus hemolyticus*, *Staphylococcus aureus*, *Blastomycetes*, *Sporotrichum schenckii*, *Streptothrix*, *B. pyocyaneus*, and *B. prodigiosus*.

It was found that these organisms are not apparently specifically stimulated to grow through the addition to ordinary media of hemoglobin or of vitamin-containing substances such as unpolished rice and wheat bran. The addition of sprouted grain to the medium caused a much more rapid growth. The author suggests as factors responsible for the growth stimulation soluble vitamins, sugars, and more soluble nitrogenous products produced in the sprouting process.

Horse flesh as human food, L. PRICE (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 5, pp. 679-692).—This article includes an historical outline of the use of horse flesh as a human food; a description of the dressed carcass of the horse, with a summary of analytical data as to its composition; a discussion of meat inspection, including the pathological conditions met with in the slaughtering of horses; a criticism of arguments advanced in opposition to the use of horse flesh as food; a description of the restrictions and means of control of the sale of horse meat; and tests for its detection.

The casein of human milk, A. W. BOSWORTH and LOUISE A. GIBLIN (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 115-117; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1971, 1972).—Casein isolated from human milk was found to contain 5.31 per cent moisture and to give the following results on analysis calculated to the dry basis: Nitrogen 15.75 per cent, phosphorus 0.7, and sulphur 0.7. These results correspond closely to those of goat's and cow's milk, previously noted (E. S. R., 34, p. 708). The casein also resembles that of goat's and cow's milk in valence, molecular weight, and in reactions with bases and with rennin.

The metabolism of the mustard oils, W. H. PETERSON (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 583-600, *figs. 4*; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1657).—

Metabolism experiments with pigs for the purpose of throwing some light on the chemical changes the mustard oils undergo in the body are reported.

Evidence is given of a very slow metabolism of the oils and of the inability of the body to dispose of these oils readily. Although not oxidized in their passage through the animal, they are not eliminated unchanged, as there is little or no mustard oil in the urine. It is possible that they are converted into some nonvolatile, less toxic substance. The fact that there is no particular increase in the volatile or total sulphur in the feces shows that the oils are absorbed from the digestive tract. From 40 to 70 per cent of the oil appears to be excreted in the urine, the remainder probably being eliminated through the lungs and skin.

Amylase and protease action of some pancreas preparations, H. C. SHERMAN and DORA E. NEUN (*Proc. Soc. Expt. Biol. and Med.*, 15 (1918), No. 4, p. 55).—The authors have shown that purified preparations of pancreatic amylase always exhibit a marked proteolytic activity, whether tested by the determination of total and of amino nitrogen, by determination of the acidity of digestion, or by the increase of electrical conductivity.

Action of pancreatic enzymes upon casein, H. C. SHERMAN and DORA E. NEUN (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 7, pp. 1138–1145; *abs. in Chem. Abs.*, 12 (1918), No. 17, p. 1786).—Continuing the investigations noted above, the authors report a comparative study of the hydrolysis of casein by various preparations derived from the pancreas. Analytical data are given of the proteolytic activities of high-grade commercial pancreatins, of the three principal fractions recovered from the pancreatin in making from it the pancreatic amylase preparations, and of the most active trypsin commercially available. The following results were obtained:

“Extraction of the pancreatin, with 50 per cent alcohol, leaves a residue having about the same proteolytic activity as the original pancreatin. The sac precipitate obtained during dialysis in 50 per cent alcohol in the course of purification of pancreatic amylase had 15 times the proteolytic activity of the original high-grade pancreatin and about 4 times that of the most active commercial trypsin which we have seen. The final preparation of pancreatic amylase purified as described in previous papers from this laboratory has proteolytic activity fully equal to that of the high-grade trypsin when tested by any of the five methods used for the measurement of proteolytic power.”

[Analysis of a so-called egg substitute], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 87–89).—An analysis of the product called “Sa-van-eg,” a so-called egg substitute, showed it to be composed mainly of yellow corn meal, with some milk powder and a little baking soda.

[Miscellaneous food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 75–90).—In addition to several articles abstracted elsewhere in this issue, this number contains an article by F. W. Christensen, entitled “Shall We Eat Whole-wheat Bread?” an analysis of a proprietary drug preparation, and data as to the composition of various foods and beverages analyzed.

Coriaria myrtifolia as an adulterant of marjoram, G. M. BERINGER (*Amer. Jour. Pharm.*, 90 (1918), No. 8, pp. 555–565, figs. 11).—Various methods employed in the detection of *C. myrtifolia* as an adulterant of marjoram are discussed, and a microscopical study is reported of the structure of marjoram and of authentic samples of the leaves of *C. myrtifolia*.

Food Surveys (U. S. Dept. Agr., Food Surveys, 1 (1918), Nos. 12, pp. 16, figs. 21; 13, pp. 16, figs. 19; 14, pp. 16, figs. 24; 2 (1918), No. 1, pp. 8).—The first of these four numbers presents data as to the commercial stocks of beans, peas,

grain sorghums, rice, and buckwheat on hand in the United States January 1, 1918. The second reports similar data as to apples and vegetables; the third as to dried fruits, nuts, and peanuts; and the fourth as to grain, flour, and miscellaneous products in the United States on July 1, 1918, including cold-storage reports.

A plan of rectal feeding, E. E. CORNWALL (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 20, p. 1451).—The principles of rectal feeding are discussed and two prescriptions given.

Studies of the gastric residuum.—II, Total phosphorus, C. C. FOWLER (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 389–393).—In continuation of previous work (E. S. R., 36, p. 562), determinations were made of the phosphorus content of 52 samples of gastric residuums from healthy women.

It was found that the total phosphorus seems to bear no relation to total acid, free acid, pepsin, or volume. The phosphorus content calculated as P_2O_5 varied from 6.48 to 30.03 mg. per 100 cc. About 58 per cent of the samples fell within the range P_2O_5 equivalent to from 12 to 18 mg., while 21 per cent lay above and 21 per cent below these values. A tendency toward a constant P_2O_5 content was shown in individuals who were examined more than once. In a previous investigation made upon a composite residuum sample obtained from 70 men a value of 12.16 mg. of P_2O_5 per 100 cc. of residuum was obtained as against the average P_2O_5 content of 15.66 mg. in this series of determinations on women.

Note on the carbon dioxid content of urine, W. DENIS and A. S. MINOT (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 569–575).—The results of a limited number of observations reported in this paper indicate that the total carbon dioxid in the 24-hour urine from a normal subject taking the ordinary mixed diet may vary from 20 to 211 cc., depending upon the combinations of acid and basic foods chosen by the individual. Attention is called to the probable importance of bicarbonate in determining the reactions of neutral and amphoteric human urines.

A study of amino nitrogen and glucose in lymph and blood before and after the injection of nutrient solutions in the intestine, B. M. HENDRIX and J. E. SWEET (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 299–307).—Amino nitrogen determinations were made on blood and lymph collected before and after the injection into the small intestine of protein and amino acid solutions, and the results were compared with those obtained when sugar was injected and the glucose content of the blood and lymph determined. Dogs which had fasted about 18 hours were used in the experiments. The results of the investigation are summarized as follows:

“Less amino nitrogen is found in the thoracic lymph than in the blood of a fasting dog. After the injection of milk, ‘peptone,’ or amino acid solutions into the intestine the amino nitrogen in both the systemic blood and lymph increases, but the amount in the lymph is greater than in the blood. Ginsberg’s findings, that the introduction of sugar solutions into the intestine increases the amount of glucose in the lymph, are confirmed. The old observation that the amount of glucose in the lymph is greater than in the blood has also been confirmed. The amount of sugar in the blood of the mesenteric veins and the lymph after the introduction of sugar into the intestine seems to be practically the same.

“It is suggested that the practically complete absorption of protein and carbohydrate by the blood is not due to a selective resorption, but to the almost infinitely large volume of blood, as compared to the volume of lymph, which flows through the walls of the intestine.”

Relationship between cholesterol and cholesterol esters in the blood during fat absorption, A. KNUDSON (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 337-346).—Determinations of the balance between cholesterol and cholesterol esters and determinations of total fat and lecithin in the whole blood and in blood plasma were made on dogs during a series of fat absorption experiments with the following results:

The quantity of cholesterol showed no constant change, agreeing with results reported by Bloor (*E. S. R.*, 35, p. 166). The cholesterol esters, total fatty acids, and lecithin increased in plasma and corpuscles, but to a greater extent in the corpuscles. A fairly constant relationship between total fatty acids and cholesterol esters and between lecithin and cholesterol esters was noted in the whole blood.

The author concludes that the greater increase of cholesterol esters and lecithin in the blood corpuscles, along with the greater amount of fatty acids, would indicate that the blood corpuscles play a very active part in fat metabolism.

The rate of dialysis of the blood sugar in experimental diabetes, I. S. KLEINER (*Jour. Biol. Chem.*, 34 (1918), No. 3, pp. 471-487, figs. 6; *abs. in Chem. Abs.*, 12 (1918), No. 16, p. 1663).—The author discusses the dialysis methods that have been used to determine whether the sugar in blood is free or combined, and describes his own experiments, differing from those of others in using the blood of diabetic as well as of normal animals, and in determining the sugar content at frequent intervals instead of at the beginning and end of the dialyzing periods.

The experimental data seem to show that sugar does not dialyze from diabetic blood in the same manner as glucose which has been added to normal blood. There is a definite retardation and sometimes a complete cessation of dialysis at certain periods in the case of the diabetic as compared with the control. This is particularly marked during the second hour, when the dialysis of the diabetic blood sugar may cease entirely.

Hypotheses suggested to explain this difference in behavior are that the retardation may be due (1) to a clogging of the membrane by fat or lipoids present in the blood, (2) to a formation of sugar while the dialysis continues, or (3) to part of the blood sugar being in a combined state. The last hypothesis is considered by the author to be the most plausible, and its significance in furnishing a possible explanation of diabetes is discussed.

The alkali reserve in the blood of pellagrins, J. W. JOBLING and E. S. MAXWELL (*Jour. Amer. Med. Assoc.*, 69 (1917), No. 24, pp. 2026, 2027).—Data obtained in the study of the alkali reserve in the blood of pellagrins show that "the alkali reserve of the blood in pellagra does not vary from normal in either the acute or the chronic cases, therefore there is no acidosis or alkalosis in pellagra. The viscosity of the blood shows a slight variation from normal."

ANIMAL PRODUCTION.

Genetics in relation to agriculture, E. B. BABCOCK and R. E. CLAUSEN (*New York: McGraw-Hill Book Co., Inc.*, 1918, pp. XX+675, pls. 4, figs. 239).—The first 14 chapters of this textbook consist of a fundamental treatment of the facts and principles of genetics under the topics of methods and scope of genetics, variation, physical basis of heredity, independent Mendelian inheritance, linkage, factors, allelomorphs, inheritance of sex and related phenomena, species hybridization, pure lines, and mutations. In the second part, which is devoted to plant breeding, the purpose has been to set forth in a practical manner the progress

that genetics has made in furnishing a rational explanation for the phenomena of variation and heredity, and in guiding the breeder so that he may reach his goal with greater speed and economy. Part 3, on animal breeding, does not claim to be a complete manual on the subject. In this part of the text the authors merely endeavor to point out a few fundamental relations existing between genetics as a pure science and animal breeding, the craft or art of improving animals and maintaining present standards of excellence.

The book closes with a glossary of technical terms used, an extensive list of literature cited, and an author and subject index.

The effect of omnivorous and vegetarian diets on reproduction in the albino rat, J. R. SLONAKER and T. A. CARD (*Science, n. ser.*, 47 (1918), No. 1209, pp. 223, 224).—In this experiment, now in its fifth year, the number of pairs of rats constantly under observation was 40. About 20 of these pairs were restricted to a vegetable diet, and the remainder were given the vegetables with some form of animal food added. As soon as one of a pair died the other was remated, or when they were too old to breed they were discarded and the cages restocked.

Some of the results secured are given in the following table:

Effect of diet on reproduction in rats.

Kind of diet.	Average number of litters per breeding pair.	Proportion of non-breeding pairs.	Total average number of litters.	Greatest number of litters.	Greatest number born from single pair.	Average number born per pair.	Average number in litters.	Average weight at birth.	Average weight at 30 days.	Average weight at 600 days.	Ratio of sexes of young.
Omnivorous.....	3.7	<i>Perct.</i> 12	3.15	5	41	15	4.8	<i>Gms.</i> 4.59	<i>Gms.</i> 28.8	<i>Gms.</i> 208	113♂ : 100♀
Vegetarian.....	1.9	56	.89	3	23	4	4.5	4.00	15.7	140	107♂ : 100♀

Matings were made to test which sex was the cause of the failure to reproduce. Vegetarian pairs, when they ceased to reproduce, were separated. New, healthy omnivorous males were mated to the vegetarian females, and new, healthy omnivorous females were mated to the vegetarian males. All these new matings failed to reproduce. The conclusion drawn is that a vegetarian diet produces sterility in both sexes and tends to exterminate the race.

Composition and digestibility of Sudan-grass hay, W. G. GAESSLER and A. C. McCANDLISH (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 4, pp. 176-186).—A résumé of previous work on Sudan-grass hay by a number of experiment stations and the U. S. Department of Agriculture is given, and the results of a study made at the Iowa Station on the composition and digestibility of the hay are reported in tabular form and discussed. Analyses made of the crop in 1915 at various stages of growth gave the following results:

Composition of dry matter of Sudan grass at various stages of growth.

Stage of growth.	Before heading.	Headed out.	Full bloom.	Half ripe.	Ripe.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Total dry matter.....	20.80	20.96	25.74	30.08	31.92
Protein.....	8.80	9.78	6.57	5.02	4.29
Nitrogen-free extract.....	48.12	46.04	50.19	53.32	53.73
Crude fiber.....	32.93	35.50	32.36	32.98	33.83
Ether extract.....	2.31	2.62	3.53	2.10	1.66
Ash.....	7.79	6.06	7.35	6.58	6.49

It is pointed out that the dry matter of Sudan grass changes slightly in composition from the time of heading until mature. The content of fat and protein was found to increase in the early stages of ripening and to decrease later, while the changes in the nitrogen-free extract and ash content were in the opposite direction. The relative proportion of crude fiber in the dry matter was greater apparently when the plants had headed out than when they were ripe.

A digestion trial was conducted with two heifers for five days, preceded by a preliminary period of seven days, during which only Sudan-grass hay was fed. The average coefficients of digestibility determined were as follows: Dry matter, 64.9 per cent; protein 47.4; nitrogen-free extract, 67.8; crude fiber, 70.6; and ether extract 58.4. From these results it is concluded that the nutrients of Sudan-grass hay are all fairly easily digested, and that it supplies energy to cattle much more efficiently than it does protein. Its net energy value is computed as 64.42 therms.

Shorthorn cattle, A. H. SANDERS (*Chicago: Sanders Publishing Co., 1918* [enl. ed.], pp. 1021, pls. 116, figs. 3).—In this edition of this treatise (E. S. R., 35, p. 169) is appended the story of the Shorthorn in America through the opening years of the present century, by B. O. Cowan, under the direction of the author.

Cooperative soft pork investigations (*Texas Sta. Bul. 226 (1918)*, pp. 3-18, figs. 5).—This bulletin is divided into four parts, each dealing with a particular line of work bearing on the firmness of pork.

I. *A method for the testing of pork on the basis of firmness*, by P. V. Ewing, R. M. Green, and L. B. Burk (pp. 5-7).—A description is given of a newly devised laboratory method by means of which a figure expressing the firmness of the sample of pork tested is obtained. The method consists in the employment of a modification of the Vicat apparatus, generally used in determining the consistency of Portland cement paste, and which is based on the application of a 300-cm. weight on a 1-cm. right cylindrical plunger. In addition, a multiplier dial is used to measure the indentation to 0.1 mm. The samples to be tested are preserved at ordinary refrigerator temperature, and their surfaces are kept fresh for testing. The retention of the natural position of the connective tissue is imperative and necessitates the preparation of the sample at as low a temperature as possible. Uniformity in the preparation of samples is also a prime requisite.

"For making the test about 1 lb. from the ham end of the back fat is required. This is placed in a 3-oz. cylindrical tin dish, 6-cm. in diameter with vertical sides approximately 4.5-cm. in height, so that the pressure is applied perpendicularly to the median line cut. The tests are made on the inner stratum of the back fat and not on the skin stratum, which contains more connective tissue and shows a firmer test. The pieces are placed on edge in the center of the can and packed with sized pieces so as to fill all air spaces as far as possible. To fill completely these spaces, cool but melted lard from the sample is poured in the voids, after which the sample is placed in the refrigerator until ready for testing.

"The temperature for testing is 0° C. . . . Before making the test the needle is thoroughly chilled in the brine solution. The end of the needle is then brought in contact with the surface of the fat and a reading of the instrument taken. The plunger is then released, and allowed to rest upon the surface of the meat for five seconds, when it is again set, and another reading taken. The difference between the two readings is a measure of the degree of firmness. This difference is expressed as points, each point representing an indentation of 0.1-mm."

II. *A tentative standard for testing pork on the basis of firmness*, by P. V. Ewing, L. B. Burk, and R. M. Gren (pp. 7-11).—A committee representing swine breeders, packers, and commission men met for the purpose of establishing a standard line for grading pork on the basis of firmness. The tests to establish this line were made by the station according to the method described above. The numerical expressions denoting the degree of firmness are given in a table. The line giving approximately the same number of errors in soft and hard samples, and which was found to be located between 10 and 11, was taken as the tentative standard, subject to revision. It is considered that pork testing under 11 at 0° can be regarded as hard, while that testing 11 or above is soft.

III. *Ante mortem grading of pork on basis of firmness*, by P. V. Ewing and L. B. Burk (pp. 11-14).—Steps were taken to devise a workable method for the determination in the live hog of the firmness of the pork after killing, but all results obtained seemed to indicate that "there is no detectible correlation between the firmness of the live hog and the firmness of the carcass he will produce." It was likewise found quite evident that no relationship exists between the ante mortem temperature of the hog and the firmness of the pork when chilled.

IV. *Method of extracting fat samples from live hogs*, by P. V. Ewing, L. H. Wright, and L. B. Burk (pp. 15-18).—A method of extracting small samples of fat from live hogs to determine at any time during the feeding period the probable quality of pork that would be produced on slaughter was developed and a description of it is given.

It was found that samples of 0.05-gm. were amply large. After testing two general methods and several devices, it was found that the use of a borer, consisting of a twisted clock spring fitting inside of a trocar canula and sharpened on the end like a bit, proved entirely satisfactory for the extraction of fat samples.

The operating area, located on the loin, 6 in. in diameter and centered 3 in. to the right of the median line and 3 in. back of the last rib, is clipped, washed with brush, soap, and hot water, and treated with iodine. The sterilized trocar is then inserted and the sample removed in as aseptic a manner as practical. After this the canula is withdrawn, and sometimes the temperature of the area is taken 0.5 in. below the surface of the skin. The opening is then filled with a 5 per cent solution of iodine in alcohol, sealed over with collodion, and treated with a mixture of tar, turpentine, and linseed oil to protect against flies and to aid in healing.

No very injurious or painful effects were observed in over 100 operations. These were in most cases bloodless, and the extracted fats were clear and white.

Influence of peanut meal on quality of pork, L. B. BURK (*Texas Sta. Bul.* 228 (1918), pp. 3-18, figs. 8).—The experiments here described were conducted in 1917 along the same general lines as the work carried on in 1916 and previously reported (*E. S. R.*, 37, p. 367), with the exception that rice bran and rice polish were added to the feeds compared. Six lots, each of 10 pure-bred Duroc-Jersey hogs, for 75 days were fed rations proportioned as follows: Lot 1, milo maize chop and cottonseed meal (6:1); lot 2, rice bran, rice polish, and cottonseed meal (4:4:1); lot 3, milo maize chop and peanut meal (7:1); lot 4, milo maize chop and peanut meal (1:1); lot 5, milo maize chop and ground whole-pressed peanuts (5:2); and lot 6 for the first 22 days was fed on peanut meal alone and for the remaining 53 days of the experiment on milo maize chop and peanut meal (2:1). During the first two weeks the hogs were brought up to full feed, and after this they were fed twice a day all they would eat.

The average daily gains per head from the different rations were as follows: Milo maize chop and peanut meal (7:1), 1.64 lbs.; milo maize chop and ground whole-pressed peanuts (5:2), 1.53; milo maize chop and cottonseed meal (6:1), 1.52; milo maize chop and peanut meal (2:1), 1.31; and milo maize chop and peanut meal (1:1), 1.3. Lot 6 on peanut meal alone made an average daily gain per head of 0.54 lbs., and when fed on milo maize chop and peanut meal (2:1), 1.64 lbs.

Lot 3 fed a ration of milo maize chop and peanut meal (7:1) thus produced the largest daily gain, and required practically the same amount of feed per 100 lbs. of gain as did lot 4 on a ration composed of equal parts of the chop and the meal. Cottonseed meal and ground whole-pressed peanuts gave practically identical results when fed with milo maize. Rice bran and rice polish produced the smallest total and average daily gain, and required the largest amount of feed per 100 lbs. of gain, but this was produced at the lowest cost.

After slaughtering, the pork of lot 1 and lot 3 was graded as firm, and that of the other lots as soft.

The utilization of phytin phosphorus by the pig, J. B. RATHER (*Arkansas Sta. Bul.* 147 (1918), pp. 3-26).—The experiments here reported were undertaken for the purpose of studying the ability of pigs to utilize the phytin phosphorus that has been found to form such a large part of the phosphorus of such feeds as corn, cottonseed meal, wheat shorts, Kafir corn, wheat bran, oats, rice bran, and rice polish (E. S. R., 39, p. 14).

Two 100-lb. pigs were fed for 16 days in digestion crates on the rations to be tested, and the excreta were collected and analyzed during the last eight days of the period.

As methods for the determination of phytin phosphorus in plant products proved unsuitable for feces a study was made of the nature of the principal phosphorus compounds in feces. When feeds were used in which the phosphorus was principally in the form of phytin, the principal if not the only acid-soluble phosphorus compound of the feces was orthophosphoric acid. For the determination of inorganic phosphorus in pig feces a modification of the Hart and Andrews method (E. S. R., 15, p. 496) gave satisfactory results. The soluble phosphorus of feces from corn, cottonseed meal, wheat shorts, Kafir corn, wheat bran, and rice polish was almost entirely inorganic in nature, and the inorganic phosphorus varied from 75 to 100 per cent of the total phosphorus of the feces. The amount of ether-soluble phosphorus was in most cases extremely small. The phosphorus compounds of the urine from these feeds appeared to be largely inorganic in nature. Fractionation of the soluble phosphorus of feces from a pig fed on wheat shorts, which had been heated to destroy phytin-splitting enzymes which might be present, failed to reveal any forms of phosphorus other than inorganic. The phosphorus eliminated in the feces from this feed treated in the manner indicated was almost entirely inorganic in nature, and differed in no way in this respect from the phosphorus in the feces from unheated wheat shorts. Feces from a pig fed on the enzym-free feed had the power to split sodium phytate in vitro.

The minimum extent to which phytin phosphorus was taken up by the pigs used in these experiments ranged from 21 to 73 per cent in the case of the several feeds tested. It is concluded that the pig has the power to split phytin completely when it is fed in its natural state, and that the enzymes of the feed are not necessary to accomplish this result.

Eliminate the slacker hen, V. G. AUBRY (*New Jersey Stas. Hints to Poultrymen*, 6 (1918), No. 10, pp. 4).—An outline is given for separating good from poor hens by means of external appearances.

General regulations governing licenses operating stockyards, or handling or dealing in live stock in or in connection with stockyards (*U. S. Dept. Agr., Off. Sec. Cic. 116 (1918), pp. 14*).—The text is given of the President's proclamation of June 18, 1918, requiring the licensing of stockyards and commission men dealing in live stock in connection therewith, and of the regulations governing the licensees.

DAIRY FARMING—DAIRYING.

Respiration apparatus, its meaning and use in experiments with dairy animals (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg [Copenhagen], 94 (1917), pp. 5-174, pls. 5, figs. 12*).—This report contains a discussion of the meaning of respiration experiments in the study of the feeding of milch cows, by H. Möllgaard; a description of the Pettenkofer respiration calorimeter and the general principles of the technique used in metabolism experiments with milch cows, by H. Möllgaard and A. C. Andersen; a preliminary account of respiration experiments with milch cows, by H. Möllgaard; and a discussion of protein substances and some newer methods for the study of their composition, by A. C. Andersen.

Coconut meal v. cottonseed meal for dairy cows, P. V. EWING and E. R. SPENCE (*Texas Sta. Bul. 225 (1918), pp. 3-9*).—The results of experiments made to compare the relative feeding values for dairy cows of coconut meal and cottonseed meal are reported. Two lots of five cows each were fed 25 lbs. of silage per head per day and a variable quantity of roughage, together with a quantity of concentrate made up of wheat bran and peanut meal 3:2. In addition to this basal ration the cows were fed as a supplemental concentrate either coconut meal, cottonseed meal, or a mixture of equal parts of the two. The experiment was conducted on a 7-day basis and was continued for 16 weeks. An individual feeding schedule based on production was followed for each cow. An analysis of the coconut meal fed is included.

It was found that for the coconut meal, cottonseed meal, and mixed rations the feed cost per pound of milk was 2.22 cts., 2.23 cts., and 2.11 cts., respectively, and per pound of milk fat 36.4 cts., 27.5 cts., and 36 cts., respectively. The gain or loss in body weight during the experiment was negligible.

It is believed that while some coconut meal can be added profitably to dairy rations to replace a part of the cottonseed meal this substitution, owing to the tendency of the coconut meal to turn rancid, is limited probably to about 2 lbs. per head per day.

The place of dairying in southern agriculture, T. BUTLER (*Prog. Farmer, 33 (1918), No. 16, pp. 512, 513*).—The importance of dairying in the upbuilding of soil fertility on the average southern farm and the place that dairying should occupy under southern farm practice are outlined.

The milk question in New England, R. W. BIRD, P. R. ALLEN, J. C. RUNKLE, ET AL. (*Boston: Chamber Com., 1917, pp. 57*).—A report upon conditions surrounding the production of milk in New England and its distribution in Boston during 1917. This investigation supplements the one previously noted (*E. S. R., 34, p. 380*), and endeavors to ascertain the solution of some of the difficulties confronting the dairy industry. The survey involved over 850 herds, aggregating 15,000 cows, on farms in New England producing market milk.

The following table gives cost per quart at the railroad station and production per cow by States of the herds involved in this survey:

Estimated cost of milk production per quart by States in New England.

State.	1916 to May, 1917.	Septem- ber, 1917.	Decem- ber, 1917.	Average production per cow.	
				This survey.	Whole State, 1910.
	Cents.	Cents.	Cents.	Pounds.	Pounds.
Maine.....	5.62	6.30	6.62	5,749	3,823
New Hampshire.....	4.03	5.25	5.67	5,944	3,758
Vermont.....	4.90	5.62	5.94	5,337	3,932
Massachusetts.....	6.47	7.46	7.69	6,005	4,525
Connecticut.....	5.53	6.71	6.82	6,009	4,188

Tables are given in the report summarizing the cost of producing milk by States on December 31, 1917. In these tables the attempt is made to standardize the quantity of feed, labor, etc., used in producing a definite amount of milk, so that the cost of production may be brought up to date by substituting new values. The cost of getting milk to Boston, including station and can expenses and freight, based on the 220 to 240 mile zone as an average, was 1.44 cts. per quart.

An investigation was also made of the factors and costs concerned in the distribution of milk in Boston. It is noted that about 30 per cent of the entire milk sold in the city is delivered to the household trade, about 25 per cent to the dealers to be sold again in bottles, and about 35 per cent to the wholesale trade in cans. The balance of approximately 10 per cent is converted into surplus product or allows for shrinkage and waste. The average cost per quart for the distribution of milk by the larger milk dealers for the fiscal year ended March 31, 1917, based on an average selling price of 10.421 cts. per quart, was as follows: Price to farmers, 4.288 cts.; waste, 0.21 ct.; country expenses, 0.401 ct.; freight, 0.628 ct.; manufacturing expenses, 1.163 cts.; delivery, 2.926 cts.; administrative expenses, 0.494 ct.; and profit, 0.311 ct. Similar data for October, 1917, based on a selling price of 14 cts. per quart, were as follows: Price to farmers, 6.976 cts.; waste, 0.339 ct.; country expenses, 0.421 ct.; freight, 0.628 ct.; manufacturing expenses, 1.25 cts.; delivery, 3.338 cts.; administrative expenses, 0.498 ct.; and profit, 0.5 ct. The average cost of distribution per quart of milk in Boston and vicinity by small dealers during the fiscal year ended March 31, 1917, was, for plant costs, 0.928 ct.; delivery, 1.211 cts.; overhead, 0.494 ct.; and total, 2.633 cts. The actual costs to these dealers varied from 1.9 to 4.5 cts. per quart.

Report of the Governors' Tri-State Milk Commission (*Penn. Dept. Agr. Bul.* 287 (1917), pp. 70, pls. 19).—The Governors' Tri-State Milk Commission was formed by the joint organization of commissions appointed by the Governors of Delaware, Maryland, and Pennsylvania, respectively, for the study of problems confronting the production and marketing of milk in these three States, with special reference to the milk supply of Baltimore, Philadelphia, and Wilmington. This report of the joint commission gives the results of public hearings bearing for the most part upon the cost of producing milk in 1916, distribution of milk, surplus milk supply, grading milk, and the food value of milk in its relation to price.

Profitable dairy herds through cow testing, A. C. RAGSDALE (*Univ. Missouri, Agr. Ext. Serv. Circ.* 43 (1918), pp. 20, figs. 10).—In addition to general notes on cow testing associations, a study is reported of the results obtained in the Jackson County cow testing association during the three years of its existence.

In this association 28 cows were sold as unprofitable the first year, 30 the second year, and 50 the third year. The average milk production per cow was 5,407 lbs. the first year, 5,984.3 the second year, and 6,223.8 the third year. During this time the averages of the fat production were 254.6, 274.5, and 288.7 lbs., respectively. During the third year the average feed cost per cow for the 10 most profitable cows in the association was \$72.07, and their average fat production, 453.9 lbs. These cows returned \$3.39 for each dollar invested in feed. The 10 least profitable cows had an average feed cost of \$66.11, and produced 181.6 lbs. of fat per cow. They returned \$1.46 for each dollar invested in feed.

The main factors tending to produce poor or good cows are outlined from a study of each individual of these 20 low and high producers. The effect of good sires in the development of high-producing dairy herds is seen in the fact that several of the highest-producing herds in this association are made up largely of descendants from two bulls.

A new plan for cow testing (*Canada Dept. Agr., Dairy and Cold Storage Branch Circ. 24 (1917), pp. 7, figs. 2*).—The plan described proposes to abolish the dairy record centers and to enlist the services of cheese makers and butter makers or other qualified testers to do the testing for each group of cooperating farmers. The farmers are to weigh and sample each cow's milk night and morning for three days every month and deliver the samples to the appointed place for testing. The records of weights and tests are to be sent to the department of agriculture at Ottawa, which agrees to employ a supervisor for each Province, pay 10 cts. per test for all Babcock tests recorded and sent in, make the necessary calculations, and supply blanks, preservative tablets for samples, and sulphuric acid for testing.

The story of three cows, W. W. SWERT (*Hoard's Dairyman*, 55 (1918), No. 13, pp. 551, 566, 567, 582, figs. 3).—An account of how the Holstein portion of the dairy herd of the University of Missouri has been built up from a few foundation animals.

In 1902 \$600 was paid for four bred heifers, since when no females have been purchased. Only three bulls have been used that were not raised on the university farm. In the meantime surplus and breeding stock has been sold for \$11,973, and the present herd numbers 38 females, valued at approximately \$16,000. In the 15 years the three of the four original cows that were retained and their offspring produced 1,561,408 lbs. of milk, containing 50,078 lbs. of fat. Notes are given on the selection of sires for use in the improvement of dairy herds.

Some aspects of the physiology of mammary secretion, R. L. HILL (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 5, pp. 642-654).—The experiments here reported were made for the purpose of studying the effect of pituitary extract injection on the quality and quantity of milk secreted, its mode of action, and the effect of its repeated injection upon the animal.

An Angora goat injected with 2 cc. of pituitrin just prior to the evening milking on three alternate evenings gave an average of 9.4 gm. of fat for the three evening milkings, while the average of the four normal evening milkings was 1.34 gm. The amount of milk secreted was also greatly increased following the injections. This increase in milk and fat secretion was followed by a decrease below normal at the next milking period. The total daily secretion of milk was only slightly altered by the injection of pituitary extract.

Complete analyses of 75 samples of milk from three goats indicate that the fat alone was materially affected by the injection.

Injections of pituitrin at 2-hour intervals gave an increase of milk and fat secretion in goats only after the first injection. Repeated injections over a prolonged period resulted in an apparent tolerance. However, this tolerance for pituitrin had entirely disappeared at the succeeding lactation period.

The results of the author's researches support the theory that the action of the pituitrin is glandular rather than muscular in nature, the secretory epithelium lining the alveoli being stimulated by its use, resulting in milk secretion.

The cow's udder and process of milk production, M. H. REYNOLDS (*Hoard's Dairyman*, 55 (1918), No. 13, pp. 552, 553, figs. 9).—A brief outline is given of the physiological factors underlying and affecting milk secretion.

Cooling milk and cream on the farm, J. A. GAMBLE (*U. S. Dept. Agr., Farmers' Bul.* 976 (1918), pp. 16, figs. 8).—This is a general treatise on the principle of cooling, effect of temperature upon the development of bacteria in milk, the use of surface coolers and milk cooling tanks and of ice and well or spring water for cooling milk, keeping milk cool during shipment, the stoppage of milk losses, and the cooling of cream.

Acidity and butter, II, F. W. BOUSKA (*N. Y. Produce Rev. and Amer. Cream*, 45 (1918), No. 22, pp. 814-816).—In this second article on the relation of cream acidity to butter quality, and the neutralization of cream (*E. S. R.*, 38, p. 281) the technique of cream neutralization is described and means to determine the amount of lime to use are set forth. It is noted that 0.3114 lb. of quicklime or 2.07426 lbs. of 15 per cent limewater should reduce the acidity 0.1 per cent in 1,000 lbs. of cream. A table is given showing how much lime-water is needed to reduce the acidity of different creams to 0.3 per cent. The effect of neutralizing cream on health is discussed.

VETERINARY MEDICINE.

Infection and resistance, H. ZINSSER (*New York: The Macmillan Co., 1918, 2. ed., rev., pp. XIII+585, figs. 44*).—This is a revised edition of the book previously noted (*E. S. R.*, 32, p. 270). The chapters on anaphylaxis have been rewritten, the material on the Abderhalden reaction has been revised, and the more recent work on enzymes added. The development of conceptions of non-specific serum and cellular reactions have been discussed, and a section on immunity in syphilis has been added. The volume also contains a chapter on Colloids and Colloidal Reactions, by S. W. Young.

The eleventh annual report of the State veterinarian of Alabama, 1917, C. A. CARY (*Ann. Rpt. State Vet. Ala.*, 11 (1917), pp. 40, figs. 6).—This report, dealing with the occurrence of and control work with the more important infectious diseases of live stock, includes accounts of tick eradication work and tuberculin testing.

Second biennial report, State Live Stock Sanitary Board of Kentucky, 1916-17, M. S. COHEN ET AL. (*Bienn. Rpt. State Live Stock Sanit. Bd. Ky.*, 2 (1916-17), pp. 101).—This report deals with the occurrence of and work with infectious diseases of the years 1916 and 1917, including accounts of bovine tuberculosis, hemorrhagic septicemia, scabies, blackleg, Texas fever, etc.

Report on operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1916, H. MARTEL (*Rap. Opér. Serv. Vét. Sanit. Paris et Dépt. Seine*, 1916, pp. 179, figs. 21).—This is the usual report (*E. S. R.*, 37, p. 780), with statistical data on the operations of the year.

[Epizootic lymphangitis and bovine tuberculosis control in Hawaii], V. A. NORGAARD (*Hawaii. Forester and Agr.*, 15 (1918), No. 4, pp. 93-100).—An outbreak of epizootic lymphangitis which took place in the Hamakua district of Hawaii is reported upon and control work with bovine tuberculosis described.

Diagnosis of pregnancy in cows, C. LÓPEZ (*Rev. Hig. y Sanidad Pecuarias [Spain]*, 7 (1917-18), No. 9-12, pp. 537-550, figs. 6).—This is a general discussion of the subject, including a detailed description of the Abderhalden test.

General guaranties of preparation and distribution which veterinarians should demand from the serum and vaccine laboratories, particularly in regard to serum for hog cholera, C. LÓPEZ (*Rev. Hig. y Sanidad Pecuarias [Spain]*, 7 (1917-18), No. 9-12, pp. 623-631).—The author points out the dangers arising from the use of poorly prepared vaccines and serums, and gives instructions for the management of the laboratories and for the preparation of serums and vaccines, with special precautions in regard to hog cholera serum.

Local reactions in pyotherapy, VELU (*Bul. Soc. Cent. Méd. Vét.*, 94 (1918), No. 8, pp. 179-182).—The author suggests that local reactions often accompanying the treatment of lymphangitis by pyotherapy are not due to incomplete sterilization of the pus, as suggested by Belin (*E. S. R.*, 39, p. 185), but to the presence in the pus of proteolytic enzymes which act upon the tissue.

The treatment of infected war wounds by magnesium sulphate, A. E. MORRISON (*Brit. Med. Jour.*, No. 2986 (1918), pp. 342-344).—During the past year the author has successfully used, in place of the concentrated solution of magnesium sulphate previously noted (*E. S. R.*, 37, p. 176), a paste or cream prepared by mixing 1.5 lbs. of dried magnesium sulphate with 11 oz. of glycerin and carbolic acid (10:1). The wound is packed and thickly covered with the cream, and the dressing of gauze and cotton is left unchanged for from three to eight days. In the case of deeper wounds the cream is syringed into the deeper part of the wound by means of a drainage tube. After a number of dressings and when the bacteriological findings show a marked diminution in the number and character of the organisms present, the wounds are closed.

Acriflavine and proflavine: Notes on their use in infected gunshot wounds, R. B. CARSLAW and W. TEMPLETON (*Lancet [London]*, 1918, I, No. 18, pp. 634, 635).—Investigations are reported on the action of acriflavine and proflavine on infected wounds, and a discussion is given of the general action of both.

The authors state that although the action of the two salts is very similar, proflavine is slower and the improvement in general condition is not so rapid. It is considered that both flavine compounds are antiseptic rather than disinfectant in their action. They have no necrotic effect upon the tissues when used in solutions no stronger than 1:1,000. Their value in the treatment of wounds seems to be in controlling and preventing the spread of sepsis.

The treatment by brilliant green of recently inflicted gunshot wounds, R. MASSIE (*Lancet [London]*, 1918, I, No. 18, p. 635).—Observations on the use of brilliant green in dressing gunshot wounds are reported. Notable features in cases treated with it are said to be the absence of edema and inflammation around the wound. It is painless in application and does not appear to interfere with the growth of epithelium.

A new disinfectant testing machine, A. M. STIMSON and M. H. NEILL (*Pub. Health Rpts. [U. S.]*, 33 (1918), No. 15, pp. 529-539, figs. 3).—The authors describe a new machine used in determining the bactericidal power of disinfectants.

Studies in forage poisoning, R. GRAHAM, A. L. BRUECKNER, and R. L. PONTIUS (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 161-192, figs. 35).—The data here presented have been substantially noted from another source (*E. S. R.*, 38, pp. 383, 384).

Salt poisoning in pigs and poultry, J. T. EDWARDS (*Jour. Compar. Path. and Ther.*, 31 (1918), No. 1, pp. 40-43).—The author records an outbreak of salt poisoning among pigs and poultry, together with a few experiments performed in an endeavor to establish the exact rôle of the salt in such cases.

"A series of experiments carried out in order to ascertain the minimum toxic dose was performed on pigeons. Three pigeons were injected into the full crop with solutions corresponding respectively with 0.625, 1.25, and 2.5 gm. per kilogram of body weight. Slight symptoms of depression were observed in the birds given the two higher doses for an hour or two after the injection, but otherwise no ill effects were produced. Five days later (6 p. m.) the same three pigeons were injected into the crop with increased doses of salt solution, namely, 2.5, 3.33, and 4.5 gm. per kilogram of body weight. The pigeon given the highest dose died 18 hours afterwards, and the one given the medium-sized dose 23 hours after the injection. The bird given the smallest dose showed no apparent symptoms. The other two became affected with great depression shortly after the injection, and this weakness became more and more marked until death set in. On post-mortem examination there were no lesions discoverable except acute congestion of the mucous membrane of the esophagus between the crop and the proventriculus. Chemical analysis of the crop contents of the two pigeons that succumbed disclosed the following amounts of unabsorbed sodium chlorid: Highest dose pigeon, 0.73 per cent (0.073 gm. to 10 gm. contents), medium dose pigeon, 0.76 per cent (0.0877 gm. in 11.5 gm. contents)."

Ascaris lumbricoides and coprophagia, C. LANE (*Indian Med. Gaz.*, 52 (1917), pp. 269-272; *abs. in Abs. Bact.*, 1 (1917), No. 6, p. 533).—The author concludes that there is no justification for doubting that the development of *A. lumbricoides* is direct.

Note on *Ascaris* infection in man, the pig, rat, and mouse, F. H. STEWART (*Indian Med. Gaz.*, 52 (1917), pp. 272, 273; *abs. in Abs. Bact.*, 1 (1917), No. 6, p. 533).—Six experiments conducted indicate that an intermediate host (rat or mouse) is required for the completion of the life cycle of *Ascaris lumbricoides* (in man or pig).

Some observations on abortion and its sequelæ, C. C. PALMER (*Vet. Alumni Quart. [Ohio State Univ.]*, 6 (1918), No. 1, pp. 122-131).—The control of abortion is discussed under the headings of herd hygiene, sexual hygiene, management of metritis and sterility, immunity, and hygiene of sucklings.

Bibliography on abortion, W. GILTNER, G. N. PORTER, and B. B. FLOWE (*Amer. Jour. Vet. Med.*, 13 (1918), No. 7, pp. 45-52).—A bibliography of the more important literature relating to infectious abortion of live stock.

Investigations on blackleg immunization, N. NITTA (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 4, pp. 466-482).—This article includes a review of existing methods of immunization against blackleg, and a report of the author's investigations which are summarized as follows:

"A virulent aerobic blackleg culture, rich in spores, can be readily obtained by using meat-piece or liver-piece broth as the culture medium and it can be preserved for a year or more with the addition of glycerin. Efficacious blackleg vaccines can be made by heating the aerobic culture rich in spores, but uniform attenuation of the virus is not always expected, so that the practical use of these vaccines should be abolished, owing to possible losses from injection.

"A mixture of immune serum and virus in proper proportion confers an active immunity on animals treated. To determine its practical value, however, further experiments are necessary. An injection of the germ-free filtrate of blackleg exudate also produces an active immunity in animals treated. . . .

"The filtrate of a pure culture of the blackleg organism confers a lasting immunity on animals treated, and it has been already successfully used in thousands of cattle in infected districts. It is inexpensive, the material for the preparation being aerobic cultures of the organism in meat-piece broth, and its injection is not accompanied by the least danger because the filtrate is quite

germ-free. The filtrate can be preserved for several months with the addition of toluol."

Improved methods of immunization against symptomatic anthrax (blackleg), R. A. KELSEY (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 6, pp. 253-262).—The methods of preparation, potency tests, and relative values of the "germ-free vaccine" or "natural aggressin" and the toxic culture filtrate for immunization against blackleg are discussed. The procedure followed by the author, in the Bureau of Animal Industry, in the preparation of the germ-free vaccine is as follows:

Susceptible animals are inoculated intramuscularly with an emulsion prepared from the affected muscle tissue of animals dead of blackleg. The animals usually succumb to the disease in from 36 to 48 hours. The skin is then removed, and the fluid from the affected area and the affected muscle tissue are collected. The tissue is finely ground and placed with the fluid in fruit jars and frozen by means of an ice-salt mixture. The jars are then removed and inverted over funnels containing thin films of cotton and the funnels drained into a pan from which, by means of a spout, the thawed fluid is discharged into a bottle. After the dripping from the jars ceases the clots are pressed to extract more of the fluid. The product, which is filtered twice through Berkefeld filters, is preserved with 0.5 per cent chloroform.

The medium with which the author obtained best results in the preparation of a toxic culture filtrate (E. S. R., 37, p. 689) is Martin's peptone solution, to which have been added ground beef and dextrose. The inoculation is preferably made with a 24- to 48-hour culture, in dextrose, beef, or liver bouillon, of organisms recovered from a guinea pig which had been inoculated with virulent blackleg material. After incubation for 10 or 12 days the product is filtered through several thicknesses of cheesecloth, next through a thin layer of asbestos wool, and then twice through Berkefeld filters of "N" porosity. It is preserved with 0.5 per cent chloroform and stored in amber-glass bottles. Potency tests of the toxic culture filtrate show that there appears to be a direct ratio between the toxicity and potency of the product.

A type of test virus which is said to have given good results in the guinea pig tests and to possess a number of advantages over the emulsion of affected tissue has been prepared by the author as follows:

Guinea pigs are inoculated intramuscularly with an emulsion of virulent blackleg tissue and usually die in from 24 to 48 hours. Cultures are then made from the carcasses into fermentation tubes containing dextrose bouillon, which has been heated for approximately 10 minutes in the Arnold sterilizer to drive off the oxygen, and then cooled to 45° C. The tubes are incubated for 24 hours in vacuum jars at 37.5°. The pure cultures are then thoroughly mixed in a crystallizing dish with sufficient lactose to make a soft paste and dried in a vacuum desiccator containing sulphuric acid. Care should be taken to protect the material from direct light. When dry the material is removed, pulverized to a fine powder in a sterile mortar, and stored in wide-mouth amber-glass bottles at refrigerator temperature. When ready for use a definite amount of the powder is weighed out and taken up in a measured amount of distilled water.

The author considers that there is apparently a distinct difference between the immunizing principles in blackleg natural aggressin and blackleg toxic culture filtrate, and that "it is possible, therefore, that immunization with blackleg natural aggressin is brought about through the production of 'anti-aggressins,' while with the toxic culture filtrate immunity is acquired through the production of antitoxin."

Concentration of symptomatic anthrax (blackleg) toxin, W. N. BERG (*Jour. Agr. Research* [U. S.], 14 (1918), No. 6, pp. 263, 264).—A preliminary report is given of some experiments made in the Bureau of Animal Industry for the purpose of devising a practical method for concentrating the blackleg toxin noted above. Attempts at precipitating the toxin with chemical agents, such as alcohol, ammonium sulphate in half and in full saturation, and zinc chlorid, were unsuccessful. An application of the method of drying described by Shackell (*E. S. R.*, 21, p. 609) was found to be successful on a laboratory scale. The details of the method are as follows:

Into each of several 9 or 15 cm. Petri dishes 10 or 25 cc. of the filtered toxin was transferred. These were kept over night in a refrigerator at -9° C. The dishes containing the frozen toxin were then transferred to Hempel desiccators containing sulphuric acid. The desiccators were evacuated with a Geryk pump to from 2 to 3 mm. of mercury and then transferred to the refrigerator at -9° where they remained for from 24 to 48 hours, or until the contents of the dishes had dried to a paste. Neutralization of the toxin with a calculated weight of acid potassium phosphate was found to produce little, if any, loss in toxicity.

The dog as a carrier of anthrax, L. SANI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig.*, 40 (1917), No. 11, pp. 315-324; *abs. in Vet. Rec.*, 30 (1917), No. 1518, p. 63).—The author concludes from the experiments conducted that anthrax bacilli occur in the feces of dogs fed upon anthrax flesh. Bacilli were found even 26, 28, and 32 days following the ingestion of infected flesh.

Hemorrhagic septicemia and its control in Pennsylvania, J. B. HARDENBERGH and F. BOERNER, JR. (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 4, pp. 482-493).—Statistics obtained in vaccinating for hemorrhagic septicemia in Pennsylvania during 1915 to 1917 are presented for the purpose of showing the value of this method of controlling the disease.

In a total of 1,831 cattle in 61 herds the deaths prior to vaccination were 204, the sick prior to vaccination 43, and the healthy animals vaccinated 1,584. Of the 43 sick vaccinated, 22 deaths followed, or 51 per cent, as compared with 24 deaths of the healthy animals, or 1.5 per cent. Deaths after one week from vaccination were 16, or 1 per cent. The herds showing no deaths following vaccination were 41, or 67 per cent.

The method employed in the production of vaccine and the reasons for its use in preference to other preparations have been previously noted (*E. S. R.*, 37, p. 179). The occurrence, etiology, anatomical changes, symptoms, and control of the disease are discussed briefly.

Leishmanioses: Kala-azar, oriental sore, American leishmaniosis, A. LAVERAN (*Leishmanioses: Kala-azar, Bouton d'Orient, Leishmaniose Américaine. Paris: Masson & Co.*, 1917, pp. III+522, pls. 6, figs. 40).—This is a monograph on human visceral leishmaniosis or kala-azar due to *Leishmania donovani* (pp. 45-278), canine visceral leishmaniosis due to a species closely resembling if not a variety of *L. donovani* (pp. 279-303) cutaneous leishmaniosis or oriental sore due to *L. tropica* (pp. 304-467), and American leishmaniosis of the skin and mucous membranes due to a variety of *L. tropica* (pp. 468-515).

[Treatment of parasitic mange] (*Vet. Rev.*, 2 (1918), No. 2, pp. 177-180).—A further review of recent literature on the subject.

The lesions produced by *Bacillus necrosis* in domesticated animals, G. GROSSO (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig.*, 40 (1917), Nos. 9, pp. 241-250; 10, pp. 271-280; *abs. in Abs. Bact.*, 2 (1918), No. 1, p. 50).—A description is given of the patho-anatomical changes produced by *B. necrosis*, which organism was isolated from calves and inoculated into rabbits, producing the characteristic pathological picture.

Preliminary report on the virulence of certain body organs in rinderpest, W. H. BOYNTON (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 410-433; *Philippine Jour. Sci., Sect. B*, 13 (1918), No. 3, pp. 127-150).—The author's experiments show that water extracts of the liver, spleen, and lymph glands 3 days old, a 0.5 per cent phenol extract of the liver, spleen, and lymph glands 5 days old, a 0.5 per cent phenol extract of the cecum and colon 5 days old, a 0.5 per cent phenol extract of heart muscle 5 days old, and 1 per cent phenol extracts of lymph glands 6, 20, and 17 days old, respectively, or of liver, spleen, cecum, and lymph glands 17 days old are highly infectious to susceptible animals. A 0.5 per cent phenol extract of liver, spleen, and lymph glands can hold the virus of rinderpest in a virulent form for periods of time varying from 8 to 55 days. A 1 per cent phenol extract of either liver or spleen 21 days old is virulent to susceptible animals and a 2 per cent phenol extract of spleen 5 days old is infectious.

When glycerin is added to a 2 per cent phenol extract which has been agitated for 48 hours the virus of rinderpest is readily destroyed. It is also destroyed in a 2 per cent phenol extract of lymph glands 8 days old. It is advisable to use a 0.75 per cent phenol extract not over 15 days old.

The larynx, pharynx, and base of tongue, the pancreas, and the skeletal muscle are not suitable tissues for making extracts in the case of rinderpest.

It is deemed very plausible that similar or even better results may be obtained with the virus of hog cholera along these lines. The tissues best adapted for this work are the liver, spleen, lymph glands, heart, fourth stomach, cecum, and colon.

Note on the use of organ extracts in place of virulent blood in immunization and hyperimmunization against rinderpest, W. H. BOYNTON (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 448-455; *Philippine Jour. Sci., Sect. B*, 13 (1918), No. 3, pp. 151-158).—Experimental evidence is given to prove that after any of the customary methods of obtaining virulent rinderpest blood have been used a large amount of additional virulent material can be obtained by extracting the organs in a weak phenol solution, as noted above. From an animal of ordinary size which was bled to death and the organs of which were extracted, 9 liters of blood and 11 liters of extract filtrate were obtained.

Simultaneous immunization and hyperimmunization experiments which were conducted with these tissue extracts showed that the extracts are as potent as virulent blood. If kept at a temperature of 15° C. (59° F.) they can be used with safety in 2,000 cc. doses for hyperimmunization. They should not, however, be given in massive injections if they have been exposed for a period of 18 hours or more to the climatic conditions in the Tropics.

The author considers that the method is also applicable to the production of hog-cholera virus, thereby reducing the cost of the virus.

Observations on the immunity to rinderpest of the Nellore (Indian) cattle and of the various Nellore native grades, S. YOUNGBERG (*Philippine Agr. Rev. [English Ed.]*, 10 (1917), No. 4, pp. 436-447, figs. 6).—"The pure Nellore cattle are very highly resistant to the Philippine strains of rinderpest, the mortality being insignificant. They are not, however, absolutely immune. In the case of native cattle, the infectivity of the virus is not appreciably attenuated by being passed through Nellore cattle. This fact makes the latter very dangerous as conveyors of the disease, as they may react without showing clinical evidence. The half-bred Nellore native cattle do not inherit the high degree of resistance to rinderpest possessed by the Nellore stock. In infections of moderate virulence they apparently have somewhat more resistance than the native animals, but in virulent infections this resistance

does not afford them any protection. From the inconclusive evidence at hand the three-fourths Nellore native grades appear to have a greater resistance than the native stock. The rinderpest problem of the Philippine Islands can not be solved by the importation of Nellore or other Indian cattle, unless possibly by carrying it out to the extent of practically eliminating the native stock."

Experiments in the transmission of trichinæ, H. B. RAFFENSPERGER (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 3, pp. 363-367).—The results obtained by the author from the experiments here reported upon support the generally accepted opinions that trichinæ are not transmissible through the feces, that unencysted trichinæ are not capable of development when meat containing them is ingested, and that trichinæ are spread from one host to another only as a result of the swallowing of meat containing the encysted larvæ of the parasites.

"The experiments failed to show that infection with trichinæ can be produced by feeding to experimental animals the intestinal stage of the parasites. No infection resulted from feeding meat containing unencysted trichinæ taken from animals killed 15, 17, and 18 days after infection, respectively, but infection resulted from meat containing newly encysted trichinæ taken from an animal killed 21 days after infection."

Studies on the biochemistry and chemotherapy of tuberculosis.—XVI, The pharmacology and toxicology of copper salts of amino acids, H. L. HUBER (*Jour. Pharmacol. and Expt. Ther.*, 11 (1918), No. 4, pp. 303-329).—Continuing investigations previously noted (E. S. R., 35, p. 181), a study is reported of the acute and chronic toxic properties of copper sulphate and three amino-acid copper compounds, copper glycinate, glutamate, and leucinate.

The salts showed no variation in action when introduced into the conjunctiva of rabbits. The lower dilutions (1 per cent) produced hyperemia and lachrymation to the same extent, while the higher dilutions were inactive.

Very little variation was shown in the ability to produce acute intoxication when introduced subcutaneously in dilute solutions. The toxic subcutaneous dose of each of the salts was found to be between 4 and 6 mg. per kilogram for guinea pigs. Introduced intracutaneously the different salts showed no variation. The lower dilutions caused necrosis and induration and the higher dilutions little or no change. No variation in action was shown when the salts were introduced subcutaneously or intramuscularly in small gradually increasing doses of from 0.5 to 1 mg. of copper per kilogram for a long period of time. No gross or microscopic changes were noted, but the liver and kidney both showed marked increase in amounts of copper when analyzed. This was also true when various salts were introduced by feeding in small, gradually increasing doses up to 10 mg. per kilogram per day.

The experimental work seems to show that the three copper amino acids examined produce the same physiological effects as a simple inorganic salt, such as copper sulphate.

Observations on trembles (milk sick) in cows, transmitted to man by milk and milk products, H. R. SCHWARZ (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 236-239).—The author reports upon observations of trembles and records two cases of the disease in man, one of which proved fatal, contracted through the consumption of milk taken from affected cows prior to the appearance of any symptoms of the disease.

Prophylaxis and treatment of exudative or contagious bovine pleuropneumonia, J. M. ALEMANY (*Rev. Hig. y Sanidad Pecuarias [Spain]*, 7 (1917-18), No. 9-12, pp. 564-572).—This article includes an historical summary of investigations on contagious bovine pleuropneumonia, a description of the symptoms and

diagnosis of the disease, and a discussion of preventive treatment by vaccination according to the Pasteur method and of therapeutic treatment with various drugs. The author advises obligatory vaccination.

Bovine intestinal coccidiosis (*Vet. Rev.*, 2 (1918), No. 2, pp. 181, 182).—A brief review of recent papers on the subject, with references to the literature.

Isocolibacillosis among calves, M. CHRISTIANSEN (*Maanedskr. Dyrleger*; 29 (1917), Nos. 10, pp. 272-278; 11, pp. 299-313; 12, pp. 324-348).—A report of studies of an enteritis of calves in Denmark caused by isocoli bacilli.

Studies in black disease.—A braxy-like disease of sheep, S. DODD (*Jour. Compar. Path. and Ther.*, 31 (1918), No. 1, pp. 1-35).—The author considers it quite probable that the disease of sheep in New South Wales known as black disease is identical with the braxy-like disease in Victoria, and with bradspot or braxy in Europe, but until the rôle of the bradspot or braxy bacillus is established upon a more unassailable footing no definite conclusions can be drawn.

Oxyurosis in the horse, A. RAILLIET (*Vet. Rev.*, 2 (1918), No. 2, pp. 139-157).—This account includes a review of the literature in connection with a bibliography of 53 titles.

The pathology of spavin, S. A. GOLDBERG (*Jour. Med. Research*, 38 (1918), No. 2, pp. 235-265 pls. 2).—Noted from another source (*E. S. R.*, 39, p. 500).

Notes on development of *Cæstrus* larvæ in the pharynx of the horse, G. T. CANNON (*Vet. Rec.*, 30 (1917), No. 1523, pp. 107-109, pl. 1).—A report upon two cases of infestation of the pharynx of the horse by *Gastrophilus pecorum*. Its habits resemble those of *G. nasalis*, recent studies of which by Dove have been noted (*E. S. R.*, 39, p. 189).

Strongylidæ in horses, W. YORKE and J. W. S. MACFIE (*Ann. Trop. Med. and Par.*, 11 (1918), No. 4, pp. 399-416, figs. 21).—Three forms here described as new, namely, *Cylicostomum longibursatum*, *C. minutum*, and *C. nassatum parvum*, were taken from horses recently received from the United States.

Horse strongyles in Canada, B. H. RANSOM and S. HADWEN (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 2, pp. 202-214, figs. 16).—Data concerning the nematodes parasitic in the large intestine of the horse found in Canada in 1917, with the exception of species of *Cylicostomum*, are presented. Up to the present time five genera and 26 species have been recognized, of which the following have been collected by the junior author in Canada and are here noted: *Strongylus equinus*, *S. edentatus*, *S. vulgaris*, *Cæsphagodontus robustus*, *Tricodontophorus serratus*, *T. minor*, *T. intermedius*, *T. tenuicollis*, *T. brevicauda*, and *Gyalocephalus capitatus*.

Etiology of an infectious disease of foals, H. MAGNUSSON (*Svensk Vet. Tidskr.*, 22 (1917), Nos. 3, pp. 81-99 figs. 5; 4, pp. 125-147, figs. 2).—An account of an affection of new-born foals caused by an organism to which the name *Bacterium viscosum equi* is given.

An infectious disease of guinea pigs, A. K. GOMEZ (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 4, pp. 511-522, figs. 2).—The author describes a new infectious disease of guinea pigs, the lesions of which are very similar to those of tuberculosis. The causative agent is apparently not identical with any of the organisms known heretofore and has been named by the author *Bacterium pickensi*. A description of the morphological and biological characteristics of the organism is given, and observations of a series of inoculation and feeding experiments conducted on 20 guinea pigs are recorded.

Important poultry diseases, D. E. SALMON (*U. S. Dept. Agr., Farmers' Bul.* 957 (1918), pp. 48, figs. 11).—This is a revision with additions by B. A. Gallagher of Farmers' Bulletin 530, previously noted (*E. S. R.*, 29, p. 385), in which the section on parasites has been revised by W. D. Foster.

Prophylaxis and treatment of diphtheria and contagious epithelioma in hens, C. LÓPEZ (*Rev. Hig. y Sanidad Pecuarias [Spain]*, 7 (1917-18), No. 9-12, pp. 550-563).—This is a general discussion of the subject, under the following headings: Diphtheritic inflammation and pathology; avian diphtheria and its symptomatic manifestations; epithelioma—symptoms, infection, and contagion; the question of identity of avian and contagious epithelioma; prophylaxis; and treatment. The views of various authors on the identity of the two diseases are summarized.

Lead poisoning in waterfowl, A. WETMORE (*Abs. in Jour. Wash. Acad. Sci.*, 8 (1918), No. 11, pp. 374, 375).—A brief account of this affection in wild ducks, whistling swans, and a few other birds which pick up and swallow pellets of shot lying in the mud in marshes and shallow lakes about old shooting blinds. These shot are held in the stomach and worn slowly away by grinding against bits of gravel taken to aid digestion, so that small particles of lead are steadily passed out into the intestine and in part absorbed. This causes a severe diarrhea, the feces are stained bright green, the birds are soon unable to fly, and a slow paralysis sets in, so that they become unable to stand.

In experiments conducted six No. 6 shot when swallowed were fatal in every instance, while in one instance one shot of that size was sufficient to cause death from lead poisoning. It was also shown that the trouble was due actually to lead, and not to arsenic or combinations thereof with lead. In all cases this lead poisoning seemed to result fatally, and on certain marshes a considerable number of waterfowl is destroyed in this manner.

RURAL ENGINEERING.

Clearing land, E. D. STRAIT (*U. S. Dept. Agr., Farmers' Bul.* 974 (1918), pp. 30, figs. 13).—Methods of clearing land that have proved successful in the cut-over sections of the United States are here presented briefly. Various methods of burning stumps and different types of mechanical stump pullers are described, the advantages of the use of dynamite are set forth, and approved methods of pasturing stump land to keep down sprouts are outlined.

Softening hard water, II, R. HULBERT (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 4, pp. 82-87).—In continuing the series of articles on hard water previously noted (*E. S. R.*, 39, p. 292) the author discusses chemical precipitation methods for softening hard water and the limitations governing their use under practical conditions.

Public Roads (*U. S. Dept. Agr., Public Roads*, 1 (1918), No. 3, pp. 46, figs. 45).—This number contains data as to Federal-aid road projects approved during May, 1918, and presents several articles and notes dealing with various phases of road construction and maintenance. There are also technical articles entitled Drainage Increasingly Vital with Growth in Heavy Traffic, by E. W. James, and Constructing a Concrete Road at Marine Camp in the Winter, by C. L. Brown.

Hay caps, H. B. McCURE (*U. S. Dept. Agr. Farmers' Bul.* 977 (1918), pp. 16, figs. 2).—This describes the use of hay caps for the protection of hay curing in cocks, with particular reference to the handling of alfalfa in the corn belt and alfalfa and mixtures of alfalfa and Johnson grass in the South. The kinds of caps and their durability, cost, and storage are discussed.

RURAL ECONOMICS.

Price-fixing and the cost of farm products, H. C. TAYLOR (*Wisconsin Sta. Bul.* 292 (1918), pp. 16, fig. 1).—This bulletin discusses the difficulties in applying the cost principle to price fixing. Data are cited indicating that on the basis

of average cost half the farmers would produce at a loss. It is deemed an open question whether feed should be charged at the cost of production or at the market price, but the total farm profit is recommended as the basis. The combined prices of a group of crops produced on a farm must be enough to make the given type of farming profitable.

Price commissions should study carefully the demands for consumption at the various possible prices and the conditions of production to find what supplies can be produced profitably at the various prices and keep the supply and demand balanced, as a bad system of price regulation may destroy agricultural industries which have required decades to build. A price commission may well act as the medium for collective bargaining in the sale of farm products and in the purchase of supplies. The commission could also "steady prices, guide production, and, in a measure, direct consumption, so that the greatest good may result to all concerned."

Statement in regard to the cost of growing an acre of wheat during the present season compared with the prewar cost (*London: Bd. Agr. and Fisheries, 1917, pp. 2*).—This is an official statement in regard to the cost of growing an acre of wheat in 1917 compared with the prewar cost. The estimated cost in 1913 was £7 7s. 11d. (\$36), and in 1917 it varied from £9 17s. to £11 17s. 2d.

Rural economy in war time, illustrated by official statistics for the first two years of the war, O. H. LARSEN (*Tidsskr. Landökonomi, No. 9 (1917), pp. 389-425*).—This contains a statistical study of prices of agricultural products, together with their influence upon the prices of land. The study covers the period of 1913 to 1916.

Finding labor to harvest the food crops, G. I. CHRISTIE (*U. S. Dept. Agr., Off. Sec. Circ. 115 (1918), pp. 8, fig. 1*).—This circular describes efforts of the U. S. Department of Agriculture in cooperation with other agencies to help the farmers harvest this year the largest acreage of crops in the history of American agriculture. The work of the farm help specialists appointed for practically every State is specially noted. Instances are cited of the successful use of emergency help from towns and cities.

The need of a more permanent supply of labor is pointed out, employment by the year, and greater use of married men being suggested.

Wheat problem of last year's harvest, H. HOOVER (*Northwest. Miller, 114 (1918), No. 11, pp. 851-852, 860-862, figs. 2*).—The author points out how the problem of the harvest of 1917 was met by the Food Administration in providing sufficient bread for the people of the United States and at the same time rendering timely and effective aid to the Allies. He shows how, out of a short crop, an exportable surplus was secured through voluntary cooperation and self-denial.

The food supply and the war (*Albany: N. Y. State Food Supply Com., 1918, pp. 32*).—This is a report of the New York State Food Supply Commission, which endeavored to set in motion forces calculated to increase food production and conservation in the State. It is stated that this commission took stock of the State's resources and established local offices to aid in supplying farm seeds, farm labor, and breeding stock, organized schoolboy labor, promoted conservation of foods, and aided in preventing waste by diseases or in marketing. This report gives details with reference to the methods used in carrying out the above program.

Report of the New York State Food Supply Commission (*Rpt. N. Y. State Food Supply Com., 1917, pp. 148*).—This report contains a summary of the reports of the officials in charge of the various phases of the work in the State.

Report of the food controller, W. J. HANNA (*Rpt. Food Controller [Canada], 1917, July-Dec., pp. 47*).—The food controller briefly describes food control in

the different European countries and the United States, and the results obtained in Canada under his direction.

The prospects of the world's food supplies after the war, R. H. REW (*Jour. Roy. Statis. Soc.*, 81 (1918), No. 1, pp. 41-74).—The author fails to see any reason to anticipate, except as the result of an abnormal failure of the world's crop, that the quantity of bread-grain in the world will be insufficient to meet the world's demand, provided it can be transported from the place where it exists to the place where it is wanted. He also concludes that there will be adequate supplies of meat in the world to supply the demands of Europe.

The future position of women in agriculture, J. C. NEWSHAM (*Jour. Farmers' Club* [London], 1918, May, pp. 67-82).—The author discusses the activities of the members of the Women's Land Army and what use will be made of their services in English agriculture after the war.

A model farm management and credit system, A. R. FOOTE (*Washington, D. C.: American Progress* [Publishing Co.], 1917, pp. VIII+59).—The author presents a plan to help the farmer obtain credit and at the same time increase his efficiency by a new method of supervision. The plan presented consists of the establishment of financial corporations incorporated and regulated by each of the several States and by the Government of the United States. Part 1 is a statement of the plan of organization, financial structure, and operating details, and part 2 discusses economic and philosophical principles underlying the plan.

A study of farm management problems in Lenawee County, Mich., H. M. DIXON and J. A. DRAKE (*U. S. Dept. Agr. Bul.* 694 (1918), pp. 36, figs. 8).—The basic data here presented were obtained in a survey of 300 owner farms and 153 tenant farms in an area typical of the northern edge of the corn belt.

It is concluded that general farming, with a limited amount of dairying, is the type most easily made profitable in this region. Specialized dairy farms apparently pay better normally than dairy and grain farms, but do not pay so well as the combination of dairying and hog raising. Dairying, with hogs and grain, usually yields a better labor income than any other combination found.

Lewanee County is primarily a live-stock section, and a greater percentage of the income is derived from the sale of live stock and live-stock products than from the sale of crop products. Men with a capital of \$1,000 to \$7,000 make better labor incomes by renting farms than by owning farms, since the rented farms are larger and the tenant can conduct a larger business than if the same amount of capital were divided.

Farm prosperity in Forsyth, E. C. BRANSON (*Winston-Salem, N. C.: Bd. Trade*, 1917, pp. 29).—The author states that the farmers imported \$1,000,000 worth of agricultural products into Forsyth County, N. C., that they might have raised themselves, and also that the cities do not depend on the surrounding farms for supplies. He advises farmers to produce their own food and feed and the cities to organize markets so that they may afford the farmers an opportunity to sell their products at a profit. The author claims that part of the prosperity of the city depends upon the prosperity of the surrounding community.

Our rural society and how to regulate it, A. AGACHE (*Nos Agglomérations Rurales Comment les Aménager. Paris: Libr. Construction Mod.* [1918], pp. XXXVI+236, pls. 31, figs. 38).—This book is an analytical study of plans for the reconstruction of rural society in France. The preface, by Georges-Risler, discusses the "reconstructed-city" plan presented in April, 1916, by President Poincaré and the Secretary of State. The author then deals with the specific problems of the devastated territory in general and how to meet them. Plans are presented for types of villages situated in the North, along the Aisne, the

Meuse, and in the Vosges, with details in regard to streets, public buildings, churches, parks, playgrounds, drainage, sanitation, slaughterhouses, etc. There are also plans for the building up of evacuated villages, among which may be mentioned Vailly (Aisne), Templeuve (North), Parois, Sommedieue, and Revigny (Meuse), and a theoretical plan for the new village of Joffreville, situated at the crossroads of a national and a departmental highway.

Characteristics of the districts and their influence on rural enterprises, G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ.*, 9 (1917), Nos. 97, pp. 44-55; 98, pp. 120-130; 99, 221-232; 100, 314-325; 101, 406-416; 102, 488-498; 103, 602-612; 104, 685-694; 105, 790-799).—In this article the author has defined the salient agricultural conditions and general characteristics of each of the eight main districts into which rural Spain is divided, and the influence that these characteristics have had, both on their economic separation, due to lack of transportation and other facilities of communication and on the methods of exploitation of the land. The author advises the improvement of agricultural methods and their official supervision. With a federation of these districts and better methods of communication, he feels that much may be accomplished toward improving the country as a whole.

Proceedings of the permanent committee of the International Institute of Agriculture (*Inst. Internat. Agr. [Rome], Comité Permanent Proc. Verb.*, 1917, pp. VIII+467, fig. 1).—This is a report of the proceedings of the meetings held monthly during 1917, at which the various committees and international delegates reported on administrative matters of the institute.

Report of the executive committee of the commonwealth advisory council of science and industry, covering the period from the date of the appointment of the executive committee (14th April, 1916) to the 30th June, 1917 (*Aust. Advisory Council Sci. and Indus., Rpt. Exec. Com.*, 1917, pp. 15-29).—Among the topics considered by this committee (E. S. R., 39, p. 3) under this heading are the control and eradication of pests and diseases of crops and the utilization of native forest and vegetable products and fisheries.

A community center.—What it is and how to organize it, H. E. JACKSON (*U. S. Bur. Ed. Bul.* 11 (1918), pp. 52, pls. 2).—Part 1 of this bulletin discusses broadly the purposes and functions of the various departments of the community center. The main features noted are the open forum, the community bank for short-time credits and for long-time credits on the amortization plan, and the buying club or cooperative exchange. Part 2 deals with details of organization and the benefits resulting from a community center. Part 3 contains a constitution prepared for a community center in Washington, D. C., and also a suggested constitution.

Annual statistical report of the New York Produce Exchange for the year 1917 (*Amer. Statis. Rpt. N. Y. Produce Ex.*, 1917, pp. 139).—This report continues the data previously noted (E. S. R., 37, p. 891) by adding data for 1917.

Production [in New Zealand] (*Statis. Dominion New Zeal.*, 3 (1915), pp. 1-114; 3 (1916), pp. 1-120).—These reports continue data previously noted (E. S. R., 35, p. 795), giving statistics for the years 1915 and 1916.

AGRICULTURAL EDUCATION.

Agricultural education in South Africa, A. I. PEROLD (*So. African Jour. Sci.*, 14 (1917), No. 5, pp. 201-209).—The author outlines briefly the history of agricultural instruction in South Africa since the giving of the first courses in 1887, the present facilities for such instruction, criticisms and suggestions for their improvement, and present and future needs.

There are at present five schools of agriculture, with experiment farms, offering 2 and 3 year diploma courses, a 1-year course, and short winter courses,

The subjects of instruction in these schools are animal and field husbandry; elementary botany, chemistry, geology, and zoology; agricultural botany, chemistry, and zoology; veterinary science; entomology; poultry husbandry; dairying; agricultural engineering and building construction; agricultural law and economics; horticulture; and viticulture and wine making (at Elsenburg only). Carpentry, general blacksmithing, and horseshoeing and harness making are taught as purely practical subjects. More than one-half of the student's time is devoted to practical work. Every student must take the full course, except in the 3-year diploma course, where one major and two minor subjects may be chosen.

The latest development in agricultural education has been the founding in 1917 of the two agricultural faculties at Stellenbosch and Pretoria, respectively, which will be integral parts of the Victoria College (the future University of Stellenbosch), and the Transvaal University College, under the future University of South Africa. The subject of agriculture is practically not to be found in the curricula of the primary and secondary schools. A little nature study and agricultural science are taught here and there.

Agricultural education in Australia, C. F. JUNTZ (*So. African Jour. Sci.*, 14 (1917), No. 5, pp. 310-231).—This is a report of a visit of inspection to some of the agricultural education institutions and experiment stations in Australia. It deals with the functions, equipment, etc., of the Roseworthy Agricultural College, farm bureaus, and experimental farms in South Australia; the Werribee Central Research Farm and other experiment farms and agricultural training in Victoria; the model education system, Hawkesbury College and experiment farms in New South Wales; and the colleges and experiment stations of Queensland.

Agricultural colleges exist in all the States except Western Australia, where a chair of agriculture has been provided in the University of Western Australia. Attention is called to the thoroughly practical character of Australia's agricultural education institutions, which aim to evolve farmers and not quasi-scientists, and to the fact that the bulk of the students come from the mercantile and professional classes. In almost every State instruction classes are available for those already actively engaged in farming, but the scattered population is given as the cause of these classes not being up to the United States standard.

The teaching of agriculture, A. W. NOLAN (*New York: Houghton Mifflin Co.*, 1918, pp. X+277).—The author discusses some reasons for teaching agriculture, the specific aims of vocational agricultural education for the individual student, and the social aims in view of modern demands, such as the conservation of natural resources, greater efficiency in rural life vocations, conservation and improvement of health in rural life, a greater appreciation of art, moral growth, rural organization, and liberal education, to which agriculture in its threefold aspect—as an industry, a business, and a life—comes with large contributions. Three main groups of rural problems, viz, the problems of farm improvement, of marketing and exchange, and of community life are stated to show a line of approach or a point of view in teaching agriculture.

Chapters are devoted to (1) nature study preceding agriculture, including guiding principles in the selection of materials and in the teaching of nature study in the grades, and suggestions for teaching the subject in grades one to six, inclusive; (2) elementary agriculture and boys' and girls' club work beginning with the seventh grade and including some suggestions as to content of courses and textbook and home project club methods; (3) high school agriculture, in which are discussed such curriculum problems as the purposes of the

course, time to be given to it, fitting the work into a unified science course, and the organization and presentation of subject matter, including suggested outlines for a 3-year junior high school agricultural course and a senior high school agricultural course comprising two units of high school work in agronomy, animal husbandry, and general horticulture, special elective courses in agriculture for one-half unit credit for the junior and senior years in soils, the farm physical plant or farm engineering, farm management, plant and animal improvement, poultry husbandry, dairy husbandry, and vegetable gardening; also of a 1-year high school general course in agriculture including home projects. Suggestions for teaching the subjects, practical field and laboratory exercises, and lesson plans accompany the outlines for the senior high school. (4) Some methods and principles in teaching agriculture, including a discussion of the science of agriculture and farm practice, the use of the textbook, lecture, and laboratory methods, reports and class recitations by students, teaching farm craft, home projects in secondary school agriculture, supervised farm practice under the Smith-Hughes Law, the use of reference material and system of filing, agricultural extension in the high school, and the use of land in teaching agriculture in secondary schools; and (5) the teacher of agriculture as the most important factor.

Appendixes contain suggestions for a farm, home, and community survey; an outline of a suggested course in nature study for the first six grades, and of a suggested course in the elements of agriculture for the seventh and eighth grades by the textbook method and the home project plan; suggestions for laboratory equipment; and extracts from the Smith-Hughes Law relative to the training of agricultural workers and the Texas plan under the Smith-Hughes Law. A bibliography of secondary school agriculture is included.

The variation in elementary courses in agriculture, J. McCaig, S. E. Lang, L. A. DeWolfe, S. Laird, J. B. Dandeno, and A. W. Cocks (*Agr. Gaz. Canada*, 5 (1918), Nos. 3, pp. 286, 287; 4, pp. 375-381).—This is a series of articles by agricultural education officials with reference to the service rendered by the various agencies of education in the field of agriculture in Nova Scotia, Quebec, Ontario, Manitoba, and Saskatchewan, in reply to an article from the Province of Alberta suggesting that there would be an advantage in a discussion by the various Provinces of the right functioning and proper province of the different grades of teaching institutions dealing with the subject of agriculture, and outlining the practice in Alberta. An examination of the courses in the different Provinces, it is stated, shows a wide variation in their content and general purposes or use. The elementary schools all have incorporated in their courses considerable bodies of work with an agricultural basis variously called nature study, rural science, elementary science, or agriculture.

Elementary agriculture for Virginia schools, E. A. Miller (*Richmond, Va.: State Dept. Pub. Instr.*, 1918, pp. 143, figs. 27).—This is a series of lessons in elementary agriculture, outlined by months, for the public schools of Virginia. Each lesson topic includes helps for teachers, a lesson outline, references, illustrative material, practical exercises, and correlation suggestions. Copies of the essentials of the different record books for Virginia are supplemented to assist teachers in familiarizing themselves with the rules governing and the reports required of clubs.

Farm machinery laboratory manual, D. Scoates (*Agricultural College, Miss.: Author*, 1918, 2. ed., pp. 98).—This is a second and enlarged edition of this manual, which has been previously noted (E. S. R., 30, p. 795). It consists of exercises in the examination of machines from an investigational standpoint, taking them apart and reassembling and testing them.

Fairs and their educational value, S. G. RUBINOW (*N. C. Agr. Ext. Serv. Circ. 69* (1918), pp. 14, figs. 5).—The author discusses the early history and development of fairs, their popularity and usefulness, and the value of their prominent educational factors—exhibits, contests, competitive entries, demonstrations, lectures, and entertainment features—which when properly correlated, each in its proportionate place, are deemed to make up the modern agricultural fair.

The organization and management of fairs, S. G. RUBINOW (*N. C. Agr. Ext. Serv. Circ. 68* (1918), pp. 24, figs. 12).—The problems of fair organizations, such as the location, grounds, buildings, public comfort, exhibits and entries, judging programs, fair catalogues, special committees, advertising, concessions, finances, etc., are discussed.

School pupils for farm work (*Agr. Gaz., Canada, 5* (1918), No. 4, pp. 371-375).—This is a series of statements by provincial education officials, briefly outlining the arrangements made by the departments of education in Prince Edward Island, Nova Scotia, Ontario, Manitoba, Saskatchewan, and Alberta to prevent boys who enlist for work on farms from losing their school standing. The Canada Food Board called for the enlistment of 25,000 boys between the ages of 15 and 19 years for farm work, and the departments of agriculture in the various Provinces provided machinery for placing the boys on the farms. The boys giving three months of satisfactory service on the farm received a bronze national honor badge, and were paid regular wages based upon the amount of work which they were capable of doing.

Camp Liberty: A farm cadet experiment, JEAN L. HUNT and C. E. ARTMAN (*Bur. Ed. Expts. [N. Y.], Bul. 7* (1918), pp. 24, figs. 9).—This is a report of a farm-labor experiment in which 25 young men from New York City, the farmers of a New York State community, and the Bureau of Educational Experiments cooperated in the summer of 1917. The economic and educational results are considered, and it was found that the irritating factors and elements of dissatisfaction felt by all concerned in the experiments were for the most part on the economic side.

In conclusion, it is believed evident that city boys can not be employed on farms to any better advantage than under such an arrangement where the camp life secures personal happiness and independence, and work is done in groups of two, three, and four under the farmer's supervision. Further, it is believed that Camp Liberty was economically as successful as were camps where no conscious educational program was undertaken. If local circumstances had not made a 10-hour working day imperative, educational activities could have been further stressed. The environment was educative in itself, and in spite of limitations it is believed that Camp Liberty succeeded in providing a life experience the value of which to city boys and to their future citizenship is hardly to be measured in immediate returns.

From its experience the bureau is inclined to doubt whether the boys' camp for farm labor can be advocated as an economic remedy of wide application in present emergencies. The farmer can be expected to use it only when other labor is unobtainable or in specially favored localities where conditions permit some adjustment of the economic dissatisfaction described. On the other hand, as a permanent feature of our educational institutions, the bureau heartily advocates the further development of such enterprises and considers that such units would be a national asset if undertaken each season in numbers sufficient to affect an appreciable percentage of city youth.

The President to the farmers of America (*U. S. Dept. Agr., Off. Sec. Circ. 114* (1918, pp. 6, 7).—Extracts from the President's message to the Farmers' Conference at Urbana, Ill., January 31, 1918, are cited.

NOTES.

Arizona University and Station.—F. J. Crider, associate horticulturist of the South Carolina College and Station, has been appointed professor of horticulture and head of the horticultural department.

California University and Station.—Additional emergency courses offered by the College of Agriculture this fall included a course in machine milking for women, given at the request of the Woman's Land Army of America, and two 4-week courses for women, the object of which was to train leaders for groups of agricultural workers.

Announcement was recently made that during the past five years 1,684 inmates of the State prison at San Quentin have availed themselves of the correspondence courses offered in agriculture. Members of the college staff have also visited the institution at least monthly to deliver lectures on some phase of agriculture. An agricultural club, with about 300 members, is an active organization in the institution.

A. H. Christiansen, instructor in agricultural extension, A. R. Sprague, assistant in agricultural extension, and M. R. Miller, assistant chemist in the insecticide laboratory, have resigned. Leave of absence has been granted to W. G. Hummel, associate professor of agricultural education, and W. F. Gericke, assistant professor of soil chemistry and bacteriology, the former to become assistant director of agriculture for the State vocational education board, and the latter for graduate study.

George C. Roeding, a member of the agricultural advisory board of the U. S. Food Administration, has been appointed a regent of the university. Recent appointments within the university include R. N. Wilson and Miss Lillias D. Francis as instructors in agricultural extension; Earl M. Dobbs, Harold E. Wahlberg, and Woodbridge O. Johnson as assistants in agricultural extension; Hugh Knight as assistant in entomology in the citrus substation at Riverside, and Miss Blythe F. Monroe as assistant in soil technology.

Delaware College and Station.—Dean Hayward has been given leave of absence for a year to serve as regional director of agricultural education in France under the Y. M. C. A. Army Overseas Educational Commission.

A. C. Whittier has been appointed chemist of the station. W. J. Young, assistant horticulturist, has resigned to become associate horticulturist at Clemson College.

Idaho University and Station.—C. W. Hickman, associate professor of animal husbandry, has been appointed professor and head of the department. O. E. McConnell has been appointed instructor in animal husbandry and assistant in the station.

R. E. Neldig, associate chemist, has been appointed professor of chemistry in the college and chemist of the station. Miss Lulu Vance has been appointed analyst in agricultural chemistry.

Robert K. Bonnett, assistant professor of farm crops at the Kansas College, has been appointed professor of farm crops and head of the department, beginning September 1. Dr. V. H. Young, assistant pathologist in the Office of Cotton, Truck, and Forage Crop Disease Investigations, of the U. S. Department of Agriculture, has been appointed professor of botany and head of the department.

Purdue University and Station.—E. G. Proulx has been appointed State chemist, and Miss M. Briggs, deputy State chemist. Dr. R. H. Carr has been appointed associate chemist of the station.

H. A. Noyes, bacteriologist and soil chemist for the department of horticulture, has resigned to accept a position with the Mellon Institute of Industrial Research. R. S. Stevenson, instructor in animal husbandry, has accepted a similar position with the Manitoba Agricultural College. E. J. Wilford, instructor in animal husbandry, has accepted a position as instructor and assistant in animal husbandry at the Kentucky University and Station. H. M. Weeter, assistant professor of dairy bacteriology and associate dairy bacteriologist, R. A. Lamson, instructor in dairy husbandry, and E. J. Petry, instructor in agronomy, have also resigned to accept positions elsewhere. J. C. Beavers, associate in soils and crops extension work, has resigned to engage in farming in North Carolina. C. H. Clink, assistant in serum production in the veterinary department, died September 17.

Recent appointments include M. H. Overton, county agent of Adams County, in the farm management division of the extension department; Frank P. Cullinan, of the school of agriculture, as a member of the department of horticulture in the station; and William Aitkenhead, of the school of agriculture, as farm mechanics specialist for the station.

Iowa College and Station.—Dr. E. D. Ball, State entomologist of Wisconsin, has been appointed chairman of the department of zoology and entomology, entomologist of the station, and State entomologist.

Kansas College and Station.—B. O. Severson, associate professor of animal breeding and in charge of animal breeding investigations since September 1, died December 4 of influenza, at the age of 31 years. Professor Severson was a graduate of the University of Wisconsin, had received the master's degree from the Pennsylvania College, and was engaged in completing work for the doctor's degree at the University of Illinois. He had been a member of the animal husbandry department at the Pennsylvania College and Station for about seven years, being engaged largely in work relating to the breeding and maintenance of beef cattle and sheep.

A department of agricultural economics has been established in the division of agriculture, and Dr. Theodore Macklin, recently on leave to serve as land specialist on the Poheny Research Foundation, has been appointed head of the department. Investigational and instructional work in farm management has been transferred from the department of agronomy to the new department, with W. E. Grimes, assistant professor of farm management immediately in charge.

E. F. Ferrin, associate professor of animal husbandry at the Iowa College, has been appointed associate professor of animal husbandry. He will be in charge of swine investigations at the station, as well as of instruction work in the department of animal husbandry, notably that pertaining to pork production.

H. W. Cave, specialist in dairy husbandry at West Virginia University, has been appointed assistant professor of dairying, and F. W. Atkeson, assistant in dairy husbandry at the college and station. Dr. Helen Bishop Thompson has been appointed dean of home economics and professor of nutrition.

Kentucky University and Station.—Recent appointments include Mark Havenhill as professor of farm mechanics, F. J. Sutton as assistant professor of horticulture, L. J. Horlacher as instructor in animal husbandry and assistant in the station, Miss Jean G. MacKinnon as acting head of the teaching division of home economics, and Miss Margaret Coffin as assistant professor of home economics.

Massachusetts College.—In order to clear up all possibility of doubt as to the exact legal status of the institution (E. S. R., 38, p. 307), a law enacted at the last session of the legislature dissolved the college as incorporated in 1863 and reincorporated it under the previous name but as a definitely State institution. The State is given full control of its activities and assumes liability for any indebtedness. The previous trustees were continued for their present term of office, all subsequent appointments being made by the governor and council as formerly. All college employees are considered to be State employees, although not included under the civil service laws.

President Butterfield has sailed for Europe in connection with his duties as a member of the Y. M. C. A. Army Overseas Educational Commission, appointed by the War Work Council of the Y. M. C. A. The object of this commission is to provide educational opportunities for soldiers in the American Expeditionary Forces. A staff is being selected, largely from the faculties of American colleges and universities, and a comprehensive program in which agriculture has an important place is being projected. The work is expected to be largely of an extension nature, and to be continued during the period of demobilization.

R. W. Redman, of the Office of Extension Work North and West of the States Relations Service, U. S. Department of Agriculture, has been appointed assistant director of the extension service and has entered upon his duties. John Phelan has been appointed director of short courses.

Minnesota University and Station.—Dr. L. I. Knight, of the University of Chicago and the West Virginia Station, has been appointed professor of plant physiology and plant physiologist of the station, effective January 1, 1919. Lavinia Stinson has been appointed instructor in foods and cookery, and John Severin, instructor in farm motors at Crookston. B. M. Gile has been appointed State supervisor of vocational agricultural education. Benjamin Cole has resigned as live stock marketing agent in agricultural extension.

Missouri University and Station.—V. R. Gardner, pomologist of the Oregon College and Station, has been appointed professor of horticulture. C. C. Wiggans, assistant professor of horticulture, has resigned to accept a research position at the Delaware Station beginning October 1, and has been succeeded by H. G. Swartwout as instructor in horticulture. W. H. Lawrence has also resigned as assistant professor of horticulture.

Dr. G. M. Reed has resigned as botanist to accept a position with the U. S. Department of Agriculture. L. G. Rinkle, assistant professor of dairy husbandry, has resigned to become food and dairy commissioner of Kansas City, and has been succeeded by W. B. Combs, instructor in dairy husbandry at Rutgers College. E. L. Dakan, assistant in poultry husbandry, has also resigned.

O. W. Weaver, of the Florida University and Station, has been appointed agricultural editor. D. J. Griswold, jr., has been appointed research assistant and instructor in animal husbandry. Other appointments include W. E. Foard, specialist in farm management demonstration at the Colorado College, as farm management demonstrator in the extension service; F. T. Kraege as assistant in agricultural extension to direct a silo campaign; C. C. Hamilton as extension instructor in entomology; and F. W. Caldwell, assistant professor of veterinary science in the extension service, as county agent for Lafayette County.

Montana College and Station.—E. J. Quinn has been transferred from research chemist of the station to assistant professor of chemistry in the college, in charge of courses in analytical and agricultural chemistry.

New Jersey College and Stations.—A department of rural engineering has been established in charge of Leslie E. Hazen. His work is to be divided between teaching in the long and short courses in agriculture and extension work in rural engineering. Demonstration work with farm tractors is expected to be an important feature of the department's activities.

During the past season the area of land under the direction of the college farm management has been increased from 350 to 600 acres. This addition has been brought about through the action of James Neilson, a member of the board of trustees, who has turned over his farm adjoining that of the college for the use of the institution.

The New Jersey College for Women opened its doors for the first time this fall with a very satisfactory enrollment. The college campus is situated near the Rutgers College farm and the agricultural buildings will be used to a considerable extent by the women's college, the short course buildings being remodeled for work in home economics.

The department of home economics has been cooperating for some time with the horticultural department in an experiment at the station orchard at Vineland. The object is to determine whether a commercial fruit grower can profitably conduct a plant for use in connection with his orchard to dispose of the cull stock of peaches through canning, drying, preserving, etc.

The experimental cranberry investigations, including tests of fertilizers, drainage, and insect control have been summarized, and with these data as a basis a new project on various phases of cranberry culture has been begun in charge of C. S. Beckwith, assistant entomologist.

Other changes in staff include the resignations of Alva Agee, State superintendent of farm demonstration; W. H. Hamilton, assistant State leader of farm demonstration; A. K. Getman, State assistant in agricultural education; W. B. Combs, assistant dairy husbandman; and W. J. Stoneback, assistant chemist. Recent appointments include the following: Geo. D. Musgrave as assistant professor of agronomy, Dr. S. A. Waksman as microbiologist, Miss Gertrude E. Macpherson as assistant plant pathologist, John Hill and Forrest Button as assistant dairy husbandmen, H. O. Sampson as State assistant for agricultural education, Van E. Leavitt as extension specialist in fruit growing, and Miss Elsie Dittman as emergency assistant State club leader.

New Mexico College and Station.—The new dairy and beef cattle barns have been completed and the sheep, hog, and horse barns are nearly ready for occupancy. Experiments in the feeding of *Yucca* to range cattle, having in view primarily the determining of its nutritive value, have been resumed. Plans have also been completed for an experiment in pasturing range cattle on the native schad scale (*Atriplex canescens*) in order to ascertain its feeding value as a maintenance emergency feed.

O. C. Cunningham, field agent of the Bureau of Animal Industry of the U. S. Department of Agriculture, was appointed head of the dairy department of the college, effective September 1. J. G. Griffith has been appointed in charge of the department of biology, with Leon H. Leonian as assistant biologist. R. H. France has been appointed assistant in the department of irrigation, and W. V. Homan assistant in the poultry department.

Cornell University.—Dr. Andrew Dickson White, first president of the university from its establishment in 1867 to 1885, and widely known throughout the world in educational and diplomatic circles, died at Ithaca, November 4, at the age of 86 years.

William J. Wright has been appointed State leader of junior extension to succeed F. L. Griffin, who has accepted a position as associate professor of agricultural education in the University of California.

North Dakota College and Station.—The work of the institution is being reorganized to bring the college, station, and extension divisions into closer affiliation with the department as a working unit. J. H. Shepperd, formerly in charge of the station department of agriculture, has been made chairman of the newly organized department of animal husbandry. Professor Shepperd will continue to give the major portion of his time to station work, but along the line of investigations in animal husbandry. F. W. Christensen, who has had charge of the college work in animal nutrition, will take over the station investigations in that subject.

The dairy department has been reorganized with J. R. Keithley as chairman. The management of the dairy herd has been placed in charge of this department.

Other departments will be reorganized during the year.

Oregon College and Station.—The new horticultural products building was opened for occupancy this fall. This building has a complete equipment of machinery and apparatus for testing and demonstrating methods of canning, drying, and preserving horticultural products, including blanching boxes, canning tables, exhaust boxes, double steamers (pressure cookers), a 20-gallon steam jacketed aluminum kettle, a 10-gallon tilting jelly kettle, a complete tunnel drier, 3 tunnels, and a kiln drier, a prune table, sulphuring boxes, peeling and paring machines, and slicing machines.

The new \$115,000 library building has also recently been opened for use.

As the results of experiments carried on at the Southern Oregon Substation, at Talent, it has been demonstrated that the proper use of sulphur in the soil greatly increases the production of alfalfa. The county agent for Crook and Deschutes Counties reports the organization of a farmers' pool for ordering 185,000 lbs. of sulphur for fertilizing purposes. This is expected to be applied to more than 2,000 acres of alfalfa.

It is announced that the so-called Oregon hens, originated at the station several years ago, have won first place in the latest 52-week international egg-laying contest at the Connecticut College, and have also broken the international contest record by 92 eggs, the total number of eggs laid by the 10 hens being 2,352.

A meeting of western horticulturists was held at the college August 5 to 9. A permanent organization was effected and plans made for annual meetings hereafter. The 1919 meeting is expected to take place at the Washington College, the University of Idaho cooperating. The members of the horticultural staff of the institution at which the meetings are to be held are to act as executive officers.

A number of changes have recently taken place in the staff of the division of horticulture. L. F. Lingle, horticultural assistant in horticultural products investigations, has resigned to take up a study of canned fish in the U. S. Department of Agriculture, and has been succeeded by H. W. Allinger. Dr. E. J. Kraus, research specialist, has become dean of special arts and sciences, and has been succeeded by E. M. Harvey. Geo. Crosswell has been appointed orchard foreman, and A. E. Murneck, research assistant.

Pennsylvania College.—F. Theodore Struck, supervisor of vocational education for Essex County, N. J., has been appointed associate professor of agricultural education.

Tennessee Station.—L. G. Willis, assistant chemist, has resigned to become chemist of the Porto Rico Station. J. B. Young and F. C. Grannis have been appointed assistant chemists.

Texas Station.—J. M. Jones, for several years in charge of animal husbandry work with sheep and goats, has been appointed assistant director as well as

chief of a new division of animal industry, formed by the merging of the divisions of dairying and poultry husbandry. J. C. Burns, for many years in charge of cattle feeding investigations, has been granted leave of absence to take up work with the Bureau of Animal Industry of the U. S. Department of Agriculture and the extension service as special agent of the Bureau in the movement of cattle from the drought-stricken regions of the western country to eastern ranges and feeding places. R. N. Harvey has resigned as poultryman in order to return to New York to take up farming.

E. A. Miller has resigned as superintendent of Substation No. 3, Angleton, to take up work in horticulture with the extension service at the college, and has been succeeded by E. B. Reynolds, formerly associate professor of agronomy. N. E. Winters, superintendent of Substation No. 10, the feeding and breeding station, has resigned to engage in extension work in agronomy at the North Carolina College, and has been succeeded by J. W. Jennings.

Utah College and Station.—An agricultural engineering experiment station was formally established December 2, as an integral part of the institution. The new station will be organized into five experimental divisions, including irrigation and drainage, roads, farm machinery and transportation, manufacture of agricultural products, and rural architecture and buildings.

A new irrigation and drainage building is being erected. Reuben L. Hansen has been appointed assistant in irrigation and drainage work in connection with the college and station. Dr. D. S. Jennings has been appointed to take charge of the soil survey work in the State.

Washington College and Station.—E. C. Johnson, dean of the division of extension at the Kansas College, has accepted an appointment as dean of the college of agriculture and director of the station, effective January 1, 1919.

States Relations Service.—Milton D. Moore, for several years associated with *Experiment Station Record* in connection with the abstracting in dairying and animal husbandry and the preparation of indexes, has resigned to become emergency demonstration agent in Laurens County, S. C. Miss M. Lenore Flint and Miss Louise B. Pritchett, associated respectively with the abstracting in rural economics and food and nutrition, have been succeeded by Miss Louise Marbut and Miss Elizabeth B. Bower.

F. E. Heald, in charge of the work in agricultural instruction in schools, has become agent for the State Vocational Education Board of Massachusetts, in charge of teacher training activities and with headquarters at the Massachusetts Agricultural College. He has been succeeded by Alvin Dille.

Dr. A. D. Holmes, acting assistant chief of the Office of Home Economics, has resigned to engage in commercial work.

L. A. Clinton, assistant chief of the Office of Extension Work in the North and West, has been appointed in charge of extension work in New Jersey, and has been succeeded by C. E. Gunzels, director of the extension service, University of Nebraska.

Khaki University.—President G. C. Creelman, of the Ontario Agricultural College, has been overseas for some time in the interest of agricultural instruction in Khaki University. This institution, a brief note of which has been previously given (E. S. R., 38, p. 700), is a peripatetic institution designed for the instruction of men at the front who had commenced their work in Canada. Already 20 lecturing centers in England and France have been organized, and a first year course in agriculture begun, and additional courses are to be arranged with eventual credit on the student's return to college in Canada. Instruction is also provided for men desiring short practical courses.

From October, 1917, to July, 1918, about 9,000 men had enrolled in all departments. The Dominion Government has voted about \$500,000 for main-

tenance of the institution and the Y. M. C. A. has promised about as much more. The head of the work is Dr. H. M. Tory, president of the University of Alberta, and the staff has been recruited largely from the Canadian military forces. Because of the practical difficulties encountered but little of the work as a whole, it is stated, is of real university grade.

National Institute of Agricultural Botany at Cambridge University.—According to a recent announcement by the president of the Board of Agriculture and Fisheries of Great Britain, active steps are being taken to establish a National Institute of Agricultural Botany at Cambridge University. This institute will be modeled on the plan of the Swedish plant breeding station at Svålof, with its primary purpose the breeding and distributing of improved varieties of agricultural crops.

The possibilities of such an institute were outlined in a speech to the House of Commons by Hon. R. E. Prothero, president of the Board of Agriculture and Fisheries, in which he pointed out its worthiness as a field for private assistance. "If any millionaire is to survive the vigilance of the Chancellor of the Exchequer he can not do better than to turn his attention and his money to the Plant Breeding Institute at Cambridge and to the Institute of Applied Botany which we are endeavoring to found there, and I believe that he would confer a great boon upon the agriculture of this country."

Subscriptions aggregating about \$180,000 have been received for the purpose, including the sum of \$50,000 immediately and \$5,000 a year for five years from a commercial firm, and \$25,000 from the Incorporated National Association of British and Irish Millers. It is announced that the Board of Agriculture and Fisheries will provide the necessary buildings and equipment.

Miscellaneous.—The Imperial College of Science and Technology is to reorganize its department of chemical technology to meet more adequately the changed conditions due to the post-war situation. An important section is to deal with the technology of carbohydrates, fats, oils, and rubber.

The agricultural advisory committees of the Ministry of Food and the Board of Agriculture and Fisheries of Great Britain have been amalgamated into a central agricultural advisory committee, with Lord Selborne as chairman.

Nature announces that a war relief fund for restoring the gardens and orchards in France, Belgium, and Serbia, which have been destroyed by the Central Powers, has been opened by the Royal Horticultural Society, for which contributions are being received by the honorary treasurer, Sir H. Veitch.

The grants in aid of agricultural research in Great Britain, mainly from the Development Fund, are estimated at £20,450 (approximately \$100,000), for the fiscal year ending March 31, 1919.

Laval University of Quebec has conferred the degree of doctor of agricultural science on J. H. Grisdale, acting deputy minister of agriculture and director of experimental farms, and A. T. Charron, chief chemist of the Province of Quebec and director of the provincial laboratories. Dr. C. D. McGilvray, lecturer and instructor in veterinary science at the Manitoba Agricultural College, has been appointed principal of the Ontario Veterinary College, vice Dr. E. A. A. Grange, resigned.

Dr. W. J. Spillman, chief of the Office of Farm Management, U. S. Department of Agriculture, has resigned to become editor of the *Farm Journal*.

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The thirty-second annual convention of the Association of American Agricultural Colleges and Experiment Stations, held in Baltimore, Maryland, January 8 to 10, 1919, has added another important gathering to the long list of memorable meetings under the auspices of this association. It assembled once more the representatives of this great national system of education and research for consultation and action, this year upon an unusual number of matters of public interest. It brought out quite forcefully the many varied ways in which these institutions have been serving the Nation during the stress of war, and how great an asset they have become in the national welfare. Even more clearly did it reveal some of the responsibilities and opportunities confronting them in the period of readjustment now at hand, and the virility and enthusiasm with which they are already looking forward to the new era.

The attendance at the meeting was surprisingly large. In accordance with the usual custom the convention had originally been announced to meet in November, 1918, but despite the postponement, the continued prevalence of the influenza epidemic, and other handicaps, a registration of two hundred and eighty-three was recorded, and the total attendance was considerably larger. Delegates were present from every State in the Union save one, and the majority of the institutions sent representatives for each of the three divisions of college administration, station, and extension work, with a goodly number of members of engineering and home economics staffs as well.

The list of organizations meeting in conjunction with the association differed somewhat from that of the previous year but was fully as comprehensive. The Society for the Promotion of Agricultural Science, the American Society of Agronomy, the American Association for the Advancement of Agricultural Teaching, and the American Association of Farmers' Institute Workers followed their customary practice by meeting immediately preceding the convention, while the National Association of Commissioners of Agriculture and the recently organized National Country Life Conference were new-

comers to the group. The American Farm Management Association, re-christened the American Farm Economics Association, held a three-day meeting paralleling the convention, two of its sessions being held jointly with the American Association for Agricultural Legislation. The Association of Official Seed Analysts also met during the week, but the annual meeting of the Association of Official Agricultural Chemists, which for several years has followed the convention, was omitted.

The program of the Association of American Agricultural Colleges and Experiment Stations was unusually full and varied, indicating how wide have become the interests of this body. The calendar of the general sessions in particular became congested with important matters, and to relieve the congestion a shortening of the second day's section meetings to permit a late afternoon general session was resorted to. This congestion was the more noteworthy because of the absence of reports from four of the nine standing committees, those on agricultural terminology, relations with the U. S. Department of Agriculture, projects and correlation of research, and publication of research, and a presentation of only a brief informal report from the committee on graduate study.

The central theme of the program was the relations of the association and its component parts to the economic and social problems of post-war reconstruction, or as Secretary Houston preferred to term it, the tasks of "further construction, of selection, and emphasis." The address of the Secretary himself, entitled *Today and Tomorrow in American Agriculture*, dealt broadly with this subject and some of the specific agricultural problems of the day. The presidential address of Dean Davenport of Illinois discussed the need of a comprehensive national policy in agriculture and advanced a number of constructive suggestions for its initiation. The report of the bibliographer, Dr. A. C. True, of the States Relations Service, consisted of references and brief notes on some seventy-five publications already available, mostly of English origin, dealing with the formulation and discussion of national policies affecting agriculture, forestry, and the settlement of ex-service men on the land.

Special phases of the subject were likewise taken up in the reports of several standing committees, notably those on experiment station organization and policy, instruction in agriculture, and extension organization and policy, and in the various sections and sub-sections. For instance, there was a session of the extension division on extension problems in the reconstruction period, a round table on women's work in reconstruction held by the home economics division, and a discussion in the engineering division and elsewhere of the op-

portunities open to the land-grant colleges in preparing men for future military service.

Practically an entire evening session of the convention was devoted to addresses by Presidents Thompson of Ohio and Pearson of Iowa, and Mr. G. M. Rommell, of the U. S. Department of Agriculture, describing their observations of agricultural conditions in England, France, and Italy as members of the Agricultural Commission to Europe. This commission, consisting of eight members appointed by the Secretary of Agriculture in August, 1918, spent about eight weeks in Europe just prior to the signing of the armistice, with a view to obtaining information to serve as a guide to agricultural policies in the United States under a continuance of the war. The members of the commission had exceptional opportunities to observe agricultural conditions at close range, and great interest was manifested by the convention in the experiences and findings reported, and the reproductions shown of a large number of photographs secured. These illustrated graphically some of the farm practices followed in England and France and the completeness of the destruction wrought in the devastated regions.

Consideration of the agricultural situation in Europe as a factor in the American farm program for 1919 was further taken up by the extension workers, both in their section meetings and in a special conference during the final general session, in which Assistant Secretaries Ousley and Christie and other representatives of this Department participated. The general policy of the Department under the greatly altered conditions was announced by Secretary Houston in his address as "to present all available agricultural information from time to time to the farmers of the Nation for their guidance, and to advise the adoption of sound agricultural practice".

The purpose of the notable presidential address of Dean Davenport was set forth as "to invite attention to the very great need at the present time of a more definite policy regarding agriculture; a policy that shall be national in its scope, universal in its interests, and comprehensive in its procedures." As a general thesis Dean Davenport maintained that "considerations of fairness and of public safety both demand a higher regard for the affairs and interests of the open country and for the welfare of the farmer and his family; that in a real democracy the farmer must stand higher than hitherto in public esteem, not because of demands he may make upon society but by reason of his worth and his service; and that he should count for more in the management of public affairs, not administratively, in which he has little skill, but in matters requiring counsel, in which he is comparatively wise and relatively unprejudiced."

The farmer's needs were discussed by Dean Davenport in detail, and some fourteen principles were enumerated as fundamental to the proper development of American agriculture, whether from a private or public point of view. These principles dealt mainly with the economic status of the farmer as the managing operator of a small business, of which the home and the family are integral parts, a typical citizen representing our largest and most fundamental industry and our greatest home builder, and as such entitled to an income comparable with his labor, investment, and managerial skill.

It was maintained that public funds should be made available for financing young men for prospective ownership and means provided for reasonable interest rates on funds loaned on land for home-building purposes. Land speculation must be discouraged, and provision made for increasing the fertility of land and maintaining adequate housing conditions on rented farms. There should be subsidization of country schools "to an extent that will insure to every child born upon the farm the opportunity of a good high-school education admitting to college, with choice of differentiation along agricultural, mechanical, commercial, scientific, or literary lines—and this without leaving the father's roof or breaking up the home and the business." In short, there must be a general recognition of agriculture in all its phases as a matter of deep public concern, and a "determination to maintain upon the land the same class of people as are those who constitute the prevailing type among the mass of American citizens."

As an agency for bringing about improved conditions, Dean Davenport highly commended the association itself and the educational system it represents. "Aiming at increased production though it does, and national in scope though it is, yet after all the basis of the system is the education and the initiative of the individual, for it is founded upon instruction of collegiate grade and based upon scientific investigation of the highest order. We could not have a better foundation for the edifice that shall one day stand as emblematical of our national aims and purposes in agriculture than is the educational system represented by this Association of American Agricultural Colleges, and there could be no better corner stone for the structure than the work of the experiment stations connected therewith."

Specifically he recommended that the association memorialize the President and Congress to provide for the appointment of a permanent national body somewhat analogous to the Country Life Commission of 1908 or the existing National Agricultural Advisory Committee, but representing not only agriculture but other interests, particularly labor and business. Such a body, he maintained, could carry on studies of agricultural conditions on a broad, judicial basis,

and could make findings of extreme weight both for legislative and administrative purposes. This recommendation subsequently received the endorsement of the association.

The relation of American agricultural institutions to the changed conditions and problems coming out of the war, and the need of definite and adequate preparation for recognizing and meeting them was discussed in considerable detail in the report of the committee on experiment station organization and policy. This report ventured the opinion that the period of readjustment may be expected to be the most severe test that has ever come to the agricultural colleges, and that the way in which they meet the situation will determine their fitness to lead in agricultural matters and show how large a factor they have really become in the life of the Nation. The changing viewpoint as to the economic position of the farmer was shown to have opened up a broad field for constructive leadership, involving both investigation and education.

The committee considered more specifically the prospective attitude of the stations, pointing out that "investigation, original inquiry, the testing of new theories are their function, and the field of the new and the unknown is their special realm of activity." These duties impose upon the stations a special responsibility in the new era for a considerable measure of independent and self-reliant inquiry.

One of the most important requirements of station organization was set forth as an intelligent development and direction of the station forces toward the special needs of the States. Not the individual preferences or qualifications of persons who may happen to constitute a station staff at a given time should be the determining factor in formulating a station program, but rather the special conditions and needs of their communities as developed and modified from time to time. Similarity of problems and conditions in particular sections, not bounded by State lines, may also suggest the advantage of cooperation between institutions and organizations around problems of common interest. These matters, it was pointed out, call for a type of administrative leadership in the station which is competent to guide scientific investigations and which has sufficient time for the thoughtful study of work and plans.

Among the special lines of inquiry which may be expected to be needed in the near future are an increased attention to the economic problems which "lie at the very root and foundation of future development quite as much as the maintenance of soil fertility does, or the prevention of disease and insect ravages, or the right feeding of

live stock." Great stress, however, was put upon the character of work along these lines deemed appropriate for a station, this being considered primarily a question of method rather than of subject. The development of sound research methods is deemed first of all necessary, so that the problems in agricultural economics may be met and solved in the same thorough and scientific way as questions in nutrition, suppression of diseases, or soil management; and the line between research and extension in this field will also need to be clearly drawn. "It will be necessary to attract men particularly qualified to enter the field, and to induce teachers to train such experts with a special view to it."

In order to afford opportunity for the consideration of these important matters the report of this committee was first presented to the station section, where it was the subject of earnest discussion. Considerable sympathy was manifested for the committee's views as to broadening the scope of the stations' work, although numerous difficulties confronting additional development were recognized. Thus it was pointed out that the stations' revenues were in some cases becoming seriously impaired by the decreased purchasing power of fixed Federal and State allotments. The scarcity of trained investigators in rural economics and sociology was also recognized as a handicap to work along this line, although, as was pointed out by Director Thorne of Ohio, a similar shortage existed in practically all lines of station work a generation ago.

The subject of regional studies of a given problem aroused some interest, Director Kilgore of North Carolina suggesting studies of the utilization of rock phosphate as a suitable problem of this sort. The project was subsequently broadened to include all phosphorus carriers, and an invitation was extended by Director Thorne for a joint conference at the Ohio Station in June open to station directors interested and members of their staffs. This invitation was accepted by the section, so that opportunity is now afforded for organizing a concerted attack upon a concrete problem by this method.

The station section also had under discussion the topic of the legislative budget as related to station work, with an address by Director Jordan of New York, and a recital of experiences by several other directors. Many instances were cited of difficulties which had arisen under the increasing restrictions being laid upon them in many States through the operation of budget systems; extension of civil service rules as to appointment and tenure of scientific employees, regulation of purchases of supplies and equipment, restriction of travel, and censorship of publications, by various bodies entirely outside the institution and its board of control. This matter was sub-

sequently brought to the attention of the association, and a recommendation from the executive committee was ultimately adopted calling the attention of the public to the danger to education and research through fiscal and similar legislation of this type. This recommendation emphasized the necessity of permitting latitude of action sufficient to maintain competent staffs, provide for emergencies, and otherwise insure development along efficient lines.

A slight change in the organization of this section was made, the program committee being enlarged to include the chairman of the committee on station organization and policy. This change corresponded to the policy already followed by the section on extension work.

The committee on instruction in agriculture, subsequently broadened in scope and enlarged under the name of the committee on instruction in agriculture, home economics, and mechanic arts, reported the results of an inquiry into the war emergency courses conducted by the agricultural colleges, both from a standpoint of their value during the war and in a permanent way. Considerable variation in practice was found in such matters as the shortening of the college year, college credit for military service and for industrial work, and the offering of emergency courses. On the whole, however, it was concluded that "the instructional work of the agricultural colleges called for less revision to meet the war emergency than that of any other class of higher educational institutions. . . . A little more emphasis on the production of grains for human food, a little on modifications in crop rotations and in farm practices to meet the labor and fertilizer shortages, a few additions to the special courses and short courses relating to these changed conditions and on the more general use of farm power machinery—these were about the only modifications in the college instruction in agriculture."

At the same time it was found that the war emergency brought out more plainly a number of ways in which the committee believes improvements may be made. "There was a large demand that could not be filled for operators of farm power machinery, for leaders in home and school garden enterprises, for county agricultural agents, and for teachers of vocational agriculture. In the making of plans to overcome this weakness, so far as it concerns agriculture, the colleges of agriculture should take a prominent part." The committee again earnestly emphasized the importance of building up strong departments of agricultural education.

Increased provision for strengthening the work in rural economics and sociology was also recommended, the report thereby supple-

menting that of the committee on station organization and policy. The criticisms sometimes made of the agricultural colleges for giving so much attention to production and so little to the grading, standardization, packing, shipping, and marketing of products were declared to be in a measure merited. The great need of accurate cost data, studies of rural cooperation and the development of work in rural sociology, both in the colleges and rural secondary schools, were also discussed. In the words of the committee, "the agricultural colleges, with their facilities for research and their extension organizations reaching more and more effectively into every rural community, are not only preeminently fitted but they have a distinct obligation to take the lead in studying these problems and in giving comprehensive consideration to them in the curricula for training rural leaders."

The report of the committee on extension organization and policy was based on questionnaires sent out to extension directors and dealt with two main questions. One of these was the relations of the boys' and girls' club work and similar extension activities to the recent extensive development of school garden campaigns by other agencies. A resolution was ultimately adopted by the association declaring its opposition to unnecessary duplication of efforts in this and related lines.

The extension committee also took up the status of the Federal emergency funds for extension work, recommending their continuation in somewhat reduced amount in accordance with estimates submitted to Congress by the Secretary of Agriculture. This position was subsequently endorsed by the association.

Both the college section and the committee on college organization and policy were largely occupied with administrative problems arising out of the suspension of hostilities and the broadening interests of the association. The relation of the colleges to military training received special consideration. Several conferences were held with the Committee on Education and Special Training of the War Department, and members of this committee explained in detail at one of the general sessions the policies of that Department with reference to the adjustment of matters following the disbanding of the Students' Army Training Corps and the proposed reorganization and development of the Reserve Officers' Training Corps.

The education of the soldier in France and on his return was also taken up. Major A. C. Monahan explained the educational work of the Division of Physical Reconstruction of the Surgeon General's Office with injured soldiers, much of it in gardening. Director C. A. Prosser, of the Federal Board for Vocational Education, discussed

the rehabilitation work of that board following discharge from the army; and Director H. J. Baker of Connecticut, representing President K. L. Butterfield of Massachusetts, described briefly the activities of the Army Overseas Educational Commission. Ways in which the agricultural colleges could cooperate in these various undertakings were suggested by the different speakers, and a resolution recommending cooperation with the Federal Board for Vocational Education in its rehabilitation work through the preparation of courses and in other ways was adopted by the association.

The attention of the convention was also directed to a number of other educational matters of immediate interest to the land-grant institutions, among these the legislation recently introduced providing for a Federal Department of Education. A motion was adopted expressing the opposition of the association to action tending to separate the agricultural colleges and experiment stations from their present administrative relationships with the U. S. Department of Agriculture.

The work of the American Council of Education, recently organized to serve as a clearing house for this country in matters pertaining to education, was explained by President Thompson. Provision was made for the representation of the association, through the executive committee, in the membership of the council.

Following a conference of the college presidents and discussion by the college section, a radical reorganization of the association was proposed, which was explained by President Stone of Purdue University. The view was set forth that the existing form of organization was no longer adapted to the conditions. Too great complexity as regards voting membership with correspondingly reduced authority resulting from its decisions, too large and heterogeneous an attendance, and the restricted representation of such activities of the land-grant institutions as engineering and home economics were among the specific difficulties enumerated, and the proposition was advanced for a reorganization which would concentrate responsibility for legislation upon the heads of institutions. The principle set forth in this statement was endorsed by the association and a committee appointed to suggest the changes necessary in the constitution. Subsequently this committee, reporting through President Stone, presented a proposed revision of the constitution to serve as a basis for action at the next convention.

Under the proposed amendments, the name of the association would be changed to the Association of Land-Grant Colleges. Membership would be restricted to these institutions and the various independent State experiment stations organized prior to the passage

of the Hatch Act and sharing in its benefits. This would apparently have the effect of eliminating the large body of experiment stations as such, including several established under State authority, and likewise the U. S. Bureau of Education, the U. S. Department of Agriculture, and the Office of Experiment Stations of that Department, all of which are now entitled to representation. Meetings would continue to be held annually, but would be organized into two kinds of sections, executive and departmental. The executive section, composed of presidents or corresponding executive officers, would have jurisdiction over all matters requiring legislative action. Departmental sections, comprising those on agricultural experiment stations, agricultural extension work, engineering, and home economics, and any others authorized from time to time by the executive section, and made up of the appropriate directors, deans, and other administrative heads, would consider problems relating to their specific lines of work and formulate recommendations for the consideration of the executive section. Provision would also be made for holding general sessions of the association, if desired.

The officers would consist of a president, a vice president, a secretary-treasurer, and an executive committee of five members, thus eliminating from the present list four vice presidents and the bibliographer. These officers would be selected by the executive section, and with the exception of the secretary-treasurer and two members of the executive committee would be restricted to members of that section. Departmental section officers would continue to be selected by the sections themselves.

The election of officers and appointment of committee members for the ensuing year resulted in comparatively few changes. The ranking vice president of the association, President C. A. Lory of Colorado, was elected president and his office filled by the election of President Brown Ayres of Tennessee. The remaining vice presidents, the secretary-treasurer, the bibliographer, and all members of the executive committee were reelected. A complete list of the various officers and committees may be found on page 800.

The Baltimore convention was thus a very interesting gathering from several points of view. Meeting in a period of transition from war to peace and with "reconstruction" one of the dominant watchwords of the day, the association revealed itself anew as progressive in its ideals and constructive in its policies. It gave considerable prominence to agriculture, particularly its economic aspects, taking advanced ground in its advocacy of a permanent agricultural program and its realization of the opportunity for the agricultural colleges and experiment stations to occupy a position of leadership in

the working out of this program. It recognized more clearly than ever before the need of additional attention on the part of these institutions to instruction and research in rural economics and sociology, as well as for a close articulation with the public school system in the training of teachers and the preparation of courses along vocational lines.

At the same time the association had under consideration numerous matters less directly related to agriculture, such as problems connected with military instruction, the status of engineering experiment station legislation, and the development of home economics work. Perhaps most far-reaching of all, in its search for increased efficiency it took steps looking toward its own internal reorganization, submitting constitutional changes which would be in many respects well-nigh revolutionary. The question of the final adoption of these changes devolves upon the next convention, presumably to be scheduled for the coming November, and seems likely to make that meeting of unusual importance and responsibility.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Calcium arsenite and arsenate as insecticides, E. B. HOLLAND and J. P. BUCKLEY (*Jour. Econ. Ent.*, 11 (1918), No. 4, pp. 354-357).—In the course of an investigation at the Massachusetts Experiment Station on the efficiency of calcium arsenates as insecticides, the authors prepared acid calcium arsenate from neutral calcium chlorid, disodium arsenate, and monosodium arsenate in equal volumes of molecular strength solutions. The mixed solutions were heated slowly to 95° C., allowed to cool, filtered in a Büchner funnel, washed free from chlorid, dried at a low temperature, and weighed.

In laboratory practice the recovery on the basis of the original calcium content averaged nearly 86 per cent. Analyses are reported of two samples of the acid arsenate prepared in this way. The author suggests that as acid calcium arsenate is soluble in water but practically insoluble in limewater, its safe application necessitates an admixture with Bordeaux or strong milk of lime.

Dog-fish liver oil, A. C. CHAPMAN (*Analyst*, 43 (1918), No. 506, pp. 156-158).—Analyses are reported of two samples of dog-fish liver oil. The percentage of unsaponifiable matter in one sample was 32.94 and in the other 9.48, which would appear to indicate that the unsaponifiable matter in this oil is subject to wide variations. Although the relationship between unsaponifiable matter and glycerids in the livers of fish is not known, the author states that these two classes of compounds must be in a constant state of change, depending doubtless upon the age and condition of the individual fish.

Wax from sugar cane, W. E. CROSS (In *Los Subproductos de la Industria Azucarera*. Buenos Aires: Univ. Tucumán, 1917, pp. 16-24).—Investigations on the quantity and quality of the wax, cerosin, of sugar cane were made with a view to the commercial utilization of the product.

The samples of sugar cane were dried, and the wax was extracted with chloroform in a Soxhlet extraction apparatus. The wax thus obtained was of a greenish-yellow color and was much softer and of a lower melting point than the pure wax. It consisted of saponifiable and unsaponifiable fractions. By fractional crystallization with benzin it was possible to separate the wax from its impurities.

The author does not consider the method practical for commercial use. The most convenient method of obtaining the pure wax from the juice is with a separatory centrifuge, the crude product being purified by crystallization from denatured alcohol.

Notes on thymol content of horsemint (*Monarda punctata*) and ajowan seed (*Carum copticum*), A. E. COLLENS (*West Indian Bul.*, 17 (1918), No. 1, pp. 50-55, fig. 1).—Analyses are reported of the oils obtained from horsemint and from ajowan seed, both of which yield considerable amounts of thymol.

The following data were obtained for the American horsemint: Sp. gr. at 28° 16.6° C.=0.928, sugar scale (Ventzke), polariscope reading -3.2 at 28°, refractive index at 28°=1.501, phenols 60.4 per cent, and nonphenols 39.6 per

cent. A table is given of the yield of oil and total phenols from horsemint at different stages of growth, the largest yield being at the budding stage. From data obtained at Montserrat and Antigua, it would appear that a good average crop of horsemint would yield 80 oz. of thymol per acre.

From samples of ajowan seed oil from Montserrat the following data were obtained: Sp. gr. at $\frac{20}{16.5^{\circ}}$ C.=0.9112, sugar scale (Ventzke), polariscope reading +3.2, phenols 47.3 per cent, nonphenols 52.7 per cent, and thymol recovered 48.5 per cent. The estimated yield of thymol per acre is 224 oz.

The occurrence of carotin in oils and vegetables, A. H. GILL (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 612-614; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1996).—Continuing investigations previously noted (E. S. R., 37, p. 13), the author has proved the presence of carotin in corn, squash, orange peel, flaxseed, mustard seed, and black sesame seed. It does not seem to be present in rape seed, white sunflower, turnip, safflower, cotton seed, or turmeric. The carotin was extracted from the dried vegetables and seeds with carbon bisulphid, any oils that were present being removed by saponification. The tests used for identification of the carotin were the same as those employed by Palmer and Eckles (E. S. R., 31, p. 273).

Specific gravity of tomato pulp, W. D. BIGELOW and F. F. FITZGERALD (*Canner*, 47 (1918), No. 6, pp. 36, 38, 40, 42).—Directions are given for determining the specific gravity of cold pulp and cyclone juice by means of a Brix hydrometer. A table is given of the specific gravity of the juice corresponding to the readings on the Brix scale. Suggestions are also made for the determination of the specific gravity by weighing a definite quantity of the pulp, either hot or cold, and for the evaporation of the pulp to the desired specific gravity.

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An attempt to filter the enzymes of milk, JEAN PICCARD and MARY RISING (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 8, pp. 1275-1281, fig. 1).—Experiments undertaken for the purpose of discovering a method of filtering milk enzymes are reported. Certified milk about 12 hours old was used in the experiments, and tests were made only for the Schardinger enzyme. The filters used were the Pasteur-Chamberland filter of porous clay and asbestos, an asbestos filter arranged on a Büchner funnel, and a Berkefeld filter.

No method for filtering the enzymes was found from which a bacteria-free filtrate was obtained. The Schardinger enzyme was found to be water-soluble; that is, it remains in the liquid portion of the milk after the casein and fat are removed by a small amount of acid. The authors suggest that it may be united in some way with some other water-soluble component of the milk and thus remain stable and active only as long as this unknown body remains stable. They consider it more probable, however, that the enzymes are separate bodies, having properties similar to those of the albumins and being of a closely allied nature.

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canned fruits and vegetables. A graduated separatory funnel is inverted and connected with a large glass bottle by means of a glass tube extending to a small Berkefeld filter in the bottom of the bottle. A vent plugged with cotton prevents the development of pressure in the bottles. The separatory funnel and connecting tubing are first filled with the desired culture medium, and the apparatus is sterilized. The inoculation is then made by pipetting into the stem of the funnel an inoculated liquid medium and adding sufficient sterile medium to make the funnel culture anaerobic when the cock is closed. The organisms grow in the medium and produce gas which forces the liquid medium down and out through the Berkefeld filter into the bottle. The gas can be drawn from time to time by connecting the separatory funnel with a gas burette.

The apparatus is said to be very satisfactory, particularly as it simulates the conditions in the all-glass can which is most extensively used in the cold-pack method.

An aspirator, J. M. JOHLIN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, p. 632, *fig. 1*).—A simple form of aspirator is described which is said to be less clumsy than the average form, to need no attention during the operation until all the gas within the apparatus has been displaced, and in which a considerably increased pressure can be developed without adding materially to the weight of the apparatus or decreasing its stability.

A new hydrogen sulphid generator, T. R. ERNEST (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 8, pp. 1224-1226, *fig. 1*).—A hydrogen sulphid generator is described which is said to have many advantages over existing types.

Method for titration of mixtures of bicarbonate and carbonate or carbonated and caustic alkali requiring neither weighing nor solutions titrated in advance, J. CLARENS (*Ann. Chim. Analyt.*, 23 (1918), No. 7, pp. 148-152).—The principle of the method consists in the determination of the amount of carbon dioxide set free in the usual alkalimetric determination. The method, which is described in full, is said to be rapid and simple of execution.

History of the methods for the determination of potassium, A. VÜRTHEIM (*Chem. Weekbl.*, 15 (1918), No. 26, pp. 827-842).—This is an historical review, with bibliography, of various analytical methods for the determination of potassium.

The determination of moisture in soils, B. S. DAVISSON and G. K. SIVASLIAN (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 5, pp. 198-204).—Investigations made at the Ohio Experiment Station dealing with the accuracy of different methods for determining soil moisture and comprising a comparison of direct drying in gas and electrically heated ovens and in a vacuum over phosphorus pentoxid at 105° C. are described. Clay and muck soils were used, these types being regarded as presenting greater difficulties in drying than other soils, due to the large surface exposed and to the relatively high hygroscopicity. The soils were air-dried and ground to pass a 20-mesh sieve, and 10-gm. samples were employed. Cornstarch was used to check the results. Summarized data are presented and briefly discussed, and the following conclusions reached:

The drying of soil samples in gas or electrically heated ovens will not give the true moisture content of the soils. Drying by the vacuum method gives trustworthy and concordant results, and 4 hours' drying at 105° in a vacuum over phosphorus pentoxid is sufficient to remove the moisture from soils having high hygroscopicity.

A new method for the rapid destruction of organic matter, P. DURET (*Compt. Rend. Acad. Sci. [Paris]*, 167 (1918), No. 3, pp. 129, 130; *abs. in Chem. Abs.*, 12 (1918), No. 21, p. 2180).—The method described is based upon the production of nascent oxygen by means of ammonium persulphate in an acid medium.

The process has been used by the author especially for the detection of arsenic and mercury in urine.

To 100 cc. of urine are added 10 cc. of pure sulphuric acid and 50 gm. of ammonium persulphate in fractions of 10 gm. each. The oxidation is complete in from $\frac{1}{2}$ to $\frac{1}{4}$ hour of heating. The method is said to be of general application and of rapid execution.

Determination of succinic acid, E. C. GREY (*Ann. Chim. Analyt.*, 23 (1918), No. 7, pp. 143-148).—The sources of error in the Pasteur method for the determination of succinic acid are discussed, and certain modifications in method to avoid these errors are outlined.

The principle of the modified method consists in determining the calcium which corresponds to the total acids and the amount which remains in solution after the precipitation of the calcium succinate, the difference representing the calcium as succinate. This method is said to have general application in the determination of succinic acid in the presence of other, even unknown, acids, provided their salts are soluble in ethyl alcohol at 85° C.

The method is described in full, together with certain precautions that must be taken to obtain accurate results.

Determination of loosely bound nitrogen as ammonia in eggs, N. HENDRICKSON and G. C. SWAN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 614-617, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 2029).—Directions are given for the determination of loosely bound nitrogen as ammonia in eggs by the aeration process of Folin. Both the titration and microchemical methods are explained with a description of the apparatus and necessary precautions. Results obtained by both methods on different grades of eggs are reported.

The determination of the moisture content of flour, F. T. SHUTT and P. J. MOLONEY (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 11 (1917-18), Sect. III, pp. 101-106).—An investigation is reported of the reliability and accuracy of the methods of determining the moisture content of flour by the use of (1) the Freas electrically heated vacuum oven in which a steady vacuum of 29.5 in. was maintained, (2) the Freas electrically heated air oven, and (3) a double-jacketed water oven or steam bath drying at ordinary atmospheric pressures and heated by gas. A comparison of the results obtained led to the following conclusions:

"The lower results obtained by heating flours to constant weight in an air oven at 100° C., as compared with those from drying in a vacuum oven at the same temperature, are not due to oxidation of the flour. They point rather to incomplete drying. Throughout this investigation it has appeared that drying flour in a vacuum at 100°, say for five hours, possesses the following points of advantage as compared with drying in an air oven at the same temperature to constant weight: (1) It gives results nearer the absolute moisture content of the flour, (2) duplicate and triplicate samples show a closer agreement, and (3) results are obtained in a much shorter drying period."

Adulteration of chicory, E. COLLIN (*Ann. Falsif.*, 11 (1918), No. 115-116, pp. 135-147, figs. 5).—This article discusses the adulteration of chicory with beet cossettes and with lupine seeds. The microscopic appearance of these adulterants is described with illustrative diagrams.

A method for the detection of foreign fats in butter fat, A. SEIDENBERG (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 617-621, fig. 1).—This is an application of the author's method¹ of fractionating fats and oils by dissolving them in two or more solvents, one or more of which has the greater solvent action upon one or more groups of glycerids and is at the same time more vola-

¹ *Jour. Indus. and Engin. Chem.*, 9 (1917), No. 9, pp. 855-858.

tile. This more volatile solvent is then removed by aspirating air through the solution, and the glycerids are separated according to their solubility.

In the application of this method to the detection of foreign fats in butter fat, a series of constants has been determined called the turbidity points, the constant representing the final volume of liquid after turbidity has been reached in 10 gm. of the substance dissolved in an alcohol and ether mixture (10:90) to a total volume of 96 cc. The temperature is kept at from 10 to 15° C. and the speed of suction so regulated as to take about 10 minutes to reduce the level of the liquid to 60 cc.

A diagram of the apparatus is given, and the details of the method are described in full. Tables are given of the constants of pure butter fat and of butter fat mixed with varying amounts of foreign fats.

Desiccated milk and its adulteration, C. PORCHER (*Ann. Falsif.*, 11 (1918), No. 115-116, pp. 150-162).—This is a report of analyses of various samples of desiccated milk, together with a description of standards for such products.

An improved method for determining citral; a modification of the Hiltner method, C. E. PARKER and R. S. HILTNER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, pp. 608-610).—In the determination of citral by the Hiltner colorimetric method (*E. S. R.*, 22, p. 513) with metaphenylenediamin hydrochlorid, the blue or green colors that are frequently produced by lemon or orange oils are considered by the authors to be caused by the oxidation of the terpene. The modification of the method based upon this assumption consists in the addition of a sufficient amount of oxalic acid to the original Hiltner reagent. The modified method is described in detail.

An improved distillation method for the determination of water in soap, R. HART (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8 pp. 598, 599).—A modified distillation method with xylene is described in which oleic acid, or red oil, is added to the xylene before distillation. This is said to increase the accuracy of the determination by keeping the soap-xylene liquid more fluid, and to shorten the time of distillation by hastening the solution of the soap in the xylene and by eliminating foaming.

Relative viscosity of oils at room temperature, C. F. SAMMET (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 8, p. 632; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 2056).—A rapid procedure which is said to be satisfactory for a relative determination of the viscosity of oils is described. The method is based upon the time of absorption of an oil when dropped upon blotting paper under uniform conditions.

The determination of cholesterol in blood serum, A. BERNHARD (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 15-18; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1980).—A revised method for the determination of cholesterol in blood, a modification of the method introduced by Henes,¹ is described. By using an alcohol-ether mixture for extraction instead of successive extractions with alcohol and with ether, and by drying the calcium hydroxid precipitate after saponification in an electric oven instead of in the air, the process is shortened from five days to five hours. The method is said to give results in close agreement with those obtained by Henes' method.

Successful canning and preserving, OLA POWELL (*Philadelphia and London: J. B. Lippincott Co.*, 1918, 2. ed., rev. and enl., pp. XX+405, pls. 6, figs. 189).—This is the second edition, revised and enlarged, of the book previously noted (*E. S. R.*, 38, p. 114), which is one of a series edited by B. R. Andrews. The changes consist of the addition of a new chapter on the canning of meat and

¹Proc. N. Y. Path. Soc., n. ser., 13 (1913), No. 7, pp. 155-170.

sea foods, references to recent publications on food conservation, and a few new illustrations.

New Jersey market standards for home canned fruits and vegetables, A. L. CLARK and HELEN E. MINCH (*N. J. Dept. Agr. Bul. 14* (1918), pp. 597-612).—This bulletin has been prepared for the aid of those who are planning to market their canned fruit and vegetables. Descriptions are given of the standard jars, rubbers, and labels. The grading and packing of the common vegetables and fruits are discussed and recipes given for canning them. The necessity of uniform methods in canning is pointed out, and suggestions are made as to the best methods of selling the canned products.

Fruit preserving without sugar, H. GOODRICH (*Gard. Chron.*, 3. ser., 64 (1918), No. 1646, pp. 11, 12).—This article discusses the general principles of preserving fruit by cold storage, drying, and sterilizing. The following directions are given for sterilizing fruit by the oven method:

Glass canning jars are filled with clean, fresh fruit, covered with lids without the rubber rings, and placed in a moderately hot oven for about one-half hour. The jars are taken out, one at a time, and the shrinkage of the preliminary heating is made up with heated fruit from an extra jar. The jars are then fitted with sterilized rubber rings, and the lids are adjusted but not clamped. After a resterilization of 15 minutes the jars are removed and sealed.

It is stated that fruit preserved in this way will keep for several years.

Pulping fruit (*Better Fruit*, 13 (1918), No. 3, p. 19).—The method described is similar to the one noted above, except that the jars of fruit are heated in a pan of water which is kept at the simmering point for half an hour. After refilling to make up for shrinkage, the jars are heated in the pan of water for another five minutes and then sealed.

Suggestions for canning pork and beans, W. D. BIGELOW and F. F. FITZGERALD (*Canner*, 47 (1918), Nos. 1, pp. 36, 38, 40; 2, pp. 38, 40, 42; 3, pp. 36, 38, 40, 41; 4, pp. 36, 38, 40, 42, 44).—In this article are discussed the different factors in typical specifications for canned pork and beans. Among the topics considered are the grade of beans, the soaking and blanching process, tomato sauce, the filling and processing of the cans, and the relation of moisture content to other factors. Methods are described for the determination of moisture in dry, soaked, and canned beans.

Purification of wastes produced from canning pork and beans, H. B. HOMMON (*Canner*, 47 (1918), Nos. 6, pp. 44, 46; 7, pp. 44, 46, 48, 50).—This is a report of an investigation in regard to possible methods for the purification of wastes produced from canning pork and beans. The plant recommended, consisting of settling tanks and filter beds, is described in full.

The sealing of preserve jars with cotton, A. TRUELLE (*Rev. Hort. [Paris]*, 90 (1918), No. 6, pp. 103, 104, fig. 1).—Attention is called to the practicability of using absorbent cotton to hermetically seal preserve jars. Methods are given and necessary precautions emphasized.

Drying of fruits and vegetables and preservation of vegetables by fermentation and salting (*Ontario Dept. Agr. Circ. 12* (1918), pp. 23, figs. 12).—This circular gives information on methods of drying, a home-manufactured apparatus for drying, preparation of the foods, and storage of the dried product. A time table for blanching and drying is included. Directions are also given for the preservation of vegetables by fermentation and salting.

Farm and home drying of fruits and vegetables, J. S. CALDWELL (*U. S. Dept. Agr., Farmers' Bul. 984* (1918), pp. 61, figs. 13).—The subject is discussed under the following headings: Possibilities and limitations of drying, fundamental principles of drying, methods and equipment for drying, directions for preparing and drying fruit and vegetable products, treatment of products after drying,

making soup mixtures, and yields of dry products. A table is given of the yield of dry products per 100 lbs. of fresh material from the more common vegetables and fruits.

Save it for winter, F. F. ROCKWELL (*New York: Frederick A. Stokes Co., 1918, pp. XIII+206, pls. 15, figs. 31*).—In addition to the usual directions for canning, drying, preserving, and storing vegetables for winter use, the book contains chapters on why summer foodstuffs should be kept for the winter, why food spoils and how to prevent it, and what materials can best be saved and by what methods.

Potato flakes and flour, C. FELDHOUSEN (*Potato Mag., 1 (1918), No. 2, pp. 8, 9, 26, figs. 4*).—This article describes a commercial process for the manufacture of potato flakes and flour. The potatoes are steamed and then dried in steam-heated revolving cylinders. The dried product is scraped from the cylinders by revolving knives and ground into flour. The flour prepared in this way is said to have excellent baking qualities.

METEOROLOGY.

Instructions governing the corn and wheat, cotton, sugar and rice, and cattle region services (*U. S. Dept. Agr., Weather Bur., 1918, pp. 8*).—This is a fourth edition of this pamphlet of instructions, and describes briefly the special services to which it relates as well as the observations required in connection with each. It is stated that "observations are made each morning at more than 400 stations in these regions and telegraphed or telephoned to 25 district centers. Daily bulletins are published at these centers, and also at 17 other points, giving in detail data collected in the immediate vicinity of each center, and a general summary of weather conditions in all parts of the region."

Rainfall and raininess, B. C. WALLIS (*U. S. Mo. Weather Rev., 46 (1918), No. 5, pp. 223, 230, figs. 2*).—This note defines isohyet and equipluve and gives diagrams showing the relation between the two.

Monthly Weather Review (*U. S. Mo. Weather Rev., 46 (1918), Nos. 5, pp. 207-264, pls. 8, figs. 15; 6, pp. 265-305, pls. 8, figs. 8*).—In addition to weather forecasts, river and flood observations, and seismological reports for May and June, 1918; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during May and June, 1918; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 5.—Constant σ in the Stefan-Boltzmann Law, by Marya Kahanowicz (reprinted abs.); Halo Observations at York, N. Y., 1917, by M. N. Stewart; Weather Bureau an Aid to Aviation and Artillery Services (reprinted); Climatology and an Abandoned Flying School (reprinted); Sovereignty of the Air and Its Relation to Civil Aerial Transport, by C. Grahame-White and H. Harper (reprinted); Diurnal Variation of Wind with Height [in France], by L. Dunoyer and G. Reboul (reprinted abs.) (*E. S. R.*, 39, p. 17); Phenomena Connected with Turbulence in the Lower Atmosphere, by G. I. Taylor (reprinted abs.); Nitrogen, Chlorin, and Sulphates in Rain and Snow, by E. L. Peck (reprinted abs.) (*E. S. R.*, 38, p. 416); Acoustics of the Atmosphere, by E. Schrödinger (reprinted abs.); Measurements of Atmospheric Electricity on Tenerife, by W. Buchheim and H. Dember (reprinted abs.); Diurnal Variation of Atmospheric Electric Potential in Clear Weather, by A. B. Chauveau (reprinted abs.); A Year's Penetrating Radiation on the Obir, by V. F. Hess and M. Kofler (reprinted abs.); Solar Disturbances and Terrestrial Weather,

by E. Huntington (continued); Predicting Minimum Temperatures in Grand Valley, Colo. (illus.), by E. S. Nichols; Rainfall and Raininess (illus.), by B. C. Wallis (see p. 718); Tornado of May 9, 1918, Pearl Rock to Calmar, Iowa, by H. P. Hardin; Meteorology in Norway for 50 Years (reprinted rev.); Frequency of Snow in Tripoli and Algeria, by F. Eredia (reprinted); "Praying" Palm Tree of Faridpur, by J. C. Bose (reprinted); "Summer Time" in 1918 (reprinted); Russia Adopts the Gregorian Calendar (reprinted); Diurnal Variation of Atmospheric Pressure (reprinted abs.); Spring of 1918 in the British Isles (reprinted); Danish Report on Arctic Ice During 1917 (reprinted abs.); Rainfall in Mysore During 1916 (reprinted abs.); Climatic Notes on Palestine, Mesopotamia, and Sinaitic Peninsula, by R. DeC. Ward (reprinted abs.); Clouds at Royal Academy, by J. S. Dines (reprinted); Grove Karl Gilbert, 1843-1918 (reprinted); Yudzi Wada, 1859-1918; and Halley Lecture of 1918 at Oxford, by N. Shaw (reprinted).

No. 6.—A South Parhelion Observed May 1, 1918, at Fruita, Colo., by J. B. Willsea; Lunar Rainbow of June 24, 1918, at Salina, Kans., by W. A. Jones; Solar Halo Phenomena Observed at Santa Fe, N. Mex., June 25, 1918, by C. E. Linney; Solar Disturbances and Terrestrial Weather (illus.), by E. Huntington (concluded); Lacustral Record of Past Climates, by C. R. Keyes; Crop Centers of the United States, by J. W. Smith, a review of an article by Waller noted on page 784; Lawn Sprinkler and Thermograph (illus.), by W. G. Reed; and A Remarkable Periodicity of High Atmospheric Pressure During Winter in the Alps, by J. Maurer (abs.).

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 4 (1917), No. 13, pp. 386, pls. 3, figs. 43).—Summaries and detailed tabulated statements of climatological data for the year 1917 are given for each State.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 5 (1918), Nos. 3, pp. 213, pls. 4, figs. 2; 4, pp. 211, pls. 4, figs. 2). These volumes contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1918, respectively.

The weather, C. N. CATLIN (*Arizona Sta. Rpt. 1916*, pp. 311-316).—Tables compiled from U. S. Weather Bureau records show the highest and lowest temperatures (with dates), dates of last killing frosts in spring and first in fall, and total annual precipitation for the eight years, 1909 to 1916, as well as the monthly and annual maximum, minimum, and mean temperatures and monthly and annual precipitation for 1916 as compared with the normal for Kingman, Flagstaff, and the Prescott dry farm in the northern half of Arizona, and the Yuma date orchard, Phoenix Weather Bureau, the State University at Tucson, and the Cochise dry farm in the southern half of the State, these being chosen as representative points because of their locations and differing altitudes, and because of the connection of the five latter with, or proximity to, agricultural work carried on by the station. The data are briefly discussed in their bearing upon the climate of the State as a whole. It is stated that the weather conditions of 1916 were as a whole favorable to the agricultural and grazing interests of the State.

Colorado climatology, R. E. TRIMBLE (*Colorado Sta. Bul. 245* (1918), pp. 3-64).—This is a revision of Bulletin 182 of this station (E. S. R., 28, p. 25), bringing the data down to date. It gives a general description of the climatology of the State and detailed record of all available data. The bulletin discusses the subject from the standpoint of relation to health and crop growth and explains especially the peculiar effect of the Continental Divide, elevation,

and rapid evaporation in modifying temperature and precipitation. The relation of snowfall to the supply of water for irrigation is also discussed, and the falsity of the popular notion that the climate is changing is referred to.

It is shown that although the rainfall is scanty it is well distributed for certain crops, the precipitation during the growing season of the year being about two-thirds of that for the entire year.

Referring to the length of the growing season as determined by killing frosts, it is stated that "at Fort Collins the average date is May 10 to 15 and September 15 to 20. At Rocky Ford and Cheyenne Wells the season is a little longer."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and G. A. SMITH (*Massachusetts Sta. Met. Buls.* 355-356 (1918), pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1918, are presented. The data are briefly discussed in general notes on the weather of each month.

Weather observations, A. J. FARLEY (*New Jersey Stas. Rpt.* 1916, pp. 108-110).—Tables are given which show monthly maximum and minimum means of temperature and daily and monthly precipitation at New Brunswick, N. J., during the year ended October 31, 1916, with general notes on the character of the weather during the year.

The most notable feature of the weather during the year was the deficiency of rainfall. Despite the fact that there was no very severe drought at any time, the total rainfall for the year was only 38.09 in., 10.63 in. below the normal.

SOILS—FERTILIZERS.

The "alkali" soils of Iowa, R. L. BANCROFT (*Iowa Sta. Bul.* 177 (1918), pp. 186-208, figs. 13).—Laboratory and greenhouse experiments are described, in which an effort was made to determine the causes and the methods of treatment of the so-called "alkali" spots in north-central Iowa (E. S. R., 33, p. 416). Samples were obtained from Wright County, Iowa, situated in the Wisconsin drift soil area, representing soils from pasture land at different elevations and from the low, productive portions and the higher, unproductive portions of cultivated fields. The percentage of acid and basic constituents in the different soil samples were determined for depths of from 0 to 6½ in., 6½ to 20 in., and 20 to 40 in. For purposes of comparison representative samples of alkali soil from Wyoming and Montana were also analyzed.

The greenhouse experiments included pot tests with Carrington clay loam soil to which lime was added in amounts ranging from 0 to 50 tons per acre in order to ascertain the extent of calcium bicarbonate formation in drained and undrained soils and the effect of the bicarbonate upon plant growth. Tests were also made in which beans were planted in Carrington clay to which different salts were added in varying concentrations in order to determine the amount necessary to kill, and pot experiments were made with alkali soil taken from a recently plowed and tile-drained field, to study the value of different soil treatments.

The results obtained from these various studies led to the following more or less definite conclusions: The efficient removal of excess water from the soil is the determining factor for successful corn production. The greatest percentage of soluble salts was found at the low elevation in the pasture soil, while in the cultivated soils the amount was much greater at the high elevation, due to the lack of drainage in the pasture soil, the salts accumulating in the low places. In the cultivated soils the soluble salts were removed first from the lower

places and more gradually from the higher places. The alkali salts were removed from the high elevations with sufficient rainfall and drainage, as was evidenced in fields drained for some time.

The alkali soils of Iowa contain mainly calcium bicarbonate, while the alkali soils from Wyoming and Montana contain principally sodium sulphate and sodium bicarbonate. The alkali problem is deemed less serious in Iowa, the total concentration of salts being less, their effects less injurious, and their removal more readily accomplished. Alkali salts other than calcium bicarbonate were found to be insufficient alone to cause injury to crops, but combined with the excess of calcium bicarbonate always present they may prove injurious.

The alkali soils of Iowa may be reclaimed by efficient drainage and the use of farm manure. Potassium chlorid and calcareous clay had no beneficial influence on such soils. Although these experiments did not include tests of green manure, straw, etc., on alkali spots, experience is held to indicate that such materials may prove very beneficial in hastening the removal of alkali salts where manure is not available in sufficient quantities.

Effects of certain alkali salts on ammonification, P. E. BROWN and D. H. JOHNSON (*Iowa Sta. Research Bul. 44* (1918), pp. 3-24, figs. 4).—The authors describe laboratory and greenhouse experiments designed to study the effect of certain so-called "alkali" salts, used with and without calcium carbonate, on ammonification. Varying quantities of sodium carbonate, sodium bicarbonate, sodium sulphate, and sodium chlorid were used, and an effort was made to determine the concentration at which each became toxic to the ammonifiers, also to ascertain whether the presence of extremely large amounts of calcium carbonate was toxic in itself and whether it altered the toxic concentrations of the different salts. The data are tabulated and briefly discussed, and the conclusions reached are held to be rather tentative.

In the laboratory experiments, 100-gm. portions of Carrington loam soil were mixed with 5 gm. of dried blood and the desired amounts of the salts, and the mixture was incubated for six days at room temperature. The results obtained may be summarized as follows: Calcium carbonate exerted a marked beneficial influence on ammonification, the greatest effect occurring with 0.3 per cent, while up to 5 per cent no decrease occurred. The alkali salts were found to exert a stimulating effect when used alone at very low concentrations, a stimulation being observed with sodium carbonate at a concentration of 0.1 per cent, with sodium bicarbonate at 0.05 per cent, with sodium sulphate at 0.1 per cent, and with sodium chlorid at 0.005 per cent. Increasing the amount of these salts, however, failed to stimulate the ammonifiers, but on the contrary retarded their action, the point of toxicity being between 0.1 and 0.2 per cent for sodium carbonate, 0.05 and 0.1 per cent for sodium bicarbonate, 0.1 and 0.5 per cent for sodium sulphate, and 0.005 and 0.01 per cent for sodium chlorid.

Calcium carbonate when used in the presence of the alkali salts reduced the toxicity of the salts to a considerable extent in every case. With sodium carbonate and bicarbonate the smallest stimulative amounts of the salts were reduced by calcium carbonate, but there was no toxicity evidenced. With sodium sulphate and sodium chlorid, however, the stimulative actions of small amounts of the salts were increased by calcium carbonate, and toxic amounts were not only rendered nontoxic but were made stimulative. This was particularly noticeable in the case of sodium chlorid. Combinations of various salts in nontoxic individual amounts in the presence of calcium carbonate become toxic to ammonification, greater concentrations becoming more toxic. Further experiments with larger amounts of calcium carbonate are deemed

desirable to ascertain whether the toxic effects of combined salts or of greater concentrations of individual salts can be removed entirely.

The greenhouse experiments were planned to check the work in the laboratory by allowing the salts to remain in contact with the soil for a comparatively long period of time. The same soil was used and after thorough mixing with the salts was placed in pots, and the optimum moisture content was maintained throughout the experiment. The first samples were taken six weeks after the experiment was begun and were treated exactly as in the case of the laboratory samples. Four subsequent samples were taken at intervals of two weeks. The results of these experiments are said to have furnished a very satisfactory confirmation of the laboratory tests and may be summarized as follows: Calcium carbonate applied at the rate of 0.6 per cent was highly stimulating to the ammonifiers. Sodium carbonate at the rate of 0.2 per cent, sodium bicarbonate at the rate of 0.1 per cent, and sodium sulphate at the rate of 0.5 per cent proved toxic to ammonification. Calcium carbonate applied with these amounts of alkali salts and with 0.01 per cent sodium chlorid removed the toxicity of the salts in all cases and in some instances made the toxic amounts of salts actually stimulative to ammonification.

Influence of reaction on nitrogen-assimilating bacteria, E. B. FRED and AUDREY DAVENPORT (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 8, pp. 317-336, fig. 1).—Previous investigations bearing on this subject are reviewed and work done at the Wisconsin Experiment Station, which had for its object to establish the relation of *Rhizobium leguminosarum* from different plants and *Azotobacter* from different sources to acid and to alkali, is reported.

In this study of the influence of reaction on the nitrogen-assimilating bacteria, 21 strains of *R. leguminosarum* and 2 of *Azotobacter* were used. In general, *R. leguminosarum* from different legumes showed similar cultural characteristics. "The most noticeable difference was that of rate of growth, certain strains developing much more rapidly than others. On the ordinary culture media *R. leguminosarum* does not show any very characteristic growth. . . .

"In all of the tests the organisms were inoculated into 50-cc. portions of mannitol solution in 200-cc. Erlenmeyer flasks, the reaction changed by the addition of sulphuric acid or sodium hydroxid, and the cultures incubated for four weeks at 25° C. At the end of the period of incubation the presence or absence of the bacteria was determined by plate counts, microscopical mounts, and by inoculation of mannitolagar slants. Aside from the total acid or alkali, the hydrogen-ion content in these cultures was measured by the colorimetric method.

"The results of these experiments show clearly that . . . the nodule bacteria from different plants behave differently toward acid. The legume bacteria may be divided into groups about as follows: (1) Critical P_H 4.9, alfalfa and sweet clover, (2) critical P_H 4.7, garden pea, field pea, and vetch, (3) critical P_H 4.2, red clover and common beans, (4) critical P_H 3.3, soy beans and velvet beans, and (5) critical P_H 3.15, lupines. The alfalfa organism is the most sensitive of the legume bacteria to acidity, and, conversely, the lupine organism is the most resistant to acidity. The toxicity of sodium hydroxid toward legume bacteria is not noticeable until the alkali is added in large amounts; approximately 10 times as much normal alkali as normal acid is required to produce a similar injury. The organisms from the nodules of different legumes failed to show any decided difference in respect to alkali. . . .

"One striking fact noted in the data of these experiments is the extreme sensitivity of *Azotobacter* to slight changes in reaction. As compared with the legume bacteria, this organism is far more sensitive. The acid limit of growth

in mannitol solution for *Azotobacter* is about $\frac{N}{1,333.3}$ and the alkaline limit about $\frac{N}{1,000}$, or the critical P_H acid value 6.5 and the alkaline value 8.6.

"In relation to hydrogen-ion concentration of medium the nodule bacteria from different legumes show a very decided difference. The evidence supports the conclusion that a correlation exists between the acid resistance of the bacteria and the acid resistance of the higher plant."

Soil reaction and the growth of *Azotobacter*, P. L. GAINNEY (*Jour. Agr. Research* [U. S.], 14 (1918), No. 7, pp. 265-271).—This is an account of investigations at the Kansas Experiment Station, a brief preliminary report of which has already been noted from another source (E. S. R., 39, p. 619).

In these investigations culture tests were made with 90 samples of soil of widely varying character and reaction to observe especially the differences in *Azotobacter* growth and nitrogen fixation. A wide variation in the nitrogen-fixing power as well as in *Azotobacter* growth was observed, but it was not found possible to correlate this variation with soil type, moisture content, or condition of the soil with respect to cultivation, fertility, etc. "The only gross factor that the presence or absence of *Azotobacter* could in any way be associated with was the elevation from which the samples were taken. As a rule those soils coming from the higher elevations gave no *Azotobacter* growth, while those from the lower levels gave growth. There were, however, a number of marked exceptions to these rules."

From a review of experimental data from various sources the author concludes that *Azotobacter* is "capable of existing in many soils which contain none or only traces of calcium carbonate, and also in some soils reacting acid as ordinarily tested. The reaction, however, apparently plays a much more important rôle than the presence of calcium carbonate."

Using the hydrogen-ion concentration method of measuring the acidity of the soils used in these experiments, it was found that "of those soils in which no *Azotobacter* were observed, all with the exception of three, gave a P_H of 5.9 or less. All of the soils which gave *Azotobacter* growth, except three, gave a P_H of 6 or above. The average P_H of soils showing no *Azotobacter* growth was 5.71 and the nitrogen fixed 3.88 mg. per culture. The average P_H of those soils showing *Azotobacter* growth was 6.78 and the average nitrogen fixed was 8.11 mg. per culture."

Correlation of the hydrogen-ion exponent and occurrence of bacteria in soil, L. J. GILLESPIE (*Science, n. ser.*, 48 (1918), No. 1242, pp. 393, 394).—Commenting on the article by Gainey noted above, the author refers to investigations by himself and others, indicating a distinct correlation between the hydrogen-ion concentration and the growth and survival of microorganisms in the soil.

Preparation and use of pure cultures for legume inoculation, C. A. MAGOON and B. F. DANA (*Washington Sta. Bul.* 149 (1918), pp. 5-16).—The authors discuss the results of a survey of the methods employed by different experiment stations in the preparation and handling of pure cultures for legume inoculation for distribution among farmers. The facts brought out by the survey have been summarized as follows:

Cultures may be supplied to farmers with but little addition to the ordinary bacteriological laboratory equipment. Cultures furnished at cost need not exceed 40 cts. per acre. The strains of *Pseudomonas radiculicola* employed are said to be best obtained by direct isolation from locally-grown legumes of the variety for which they are to be used later. The use of glue or other adhesive

in applying the culture to the seed is said to be unnecessary, and the use of nutrients in the preparation of the bacterial suspension is deemed to be of questionable value. Solid media were found to be superior to liquid media for laboratory cultivation and shipment of pure cultures of *P. radicicola*.

Manuring for higher crop production, E. J. RUSSELL (*Cambridge, Eng.: Univ. Press, 1917, 2. ed., rev. and enl., pp. VI+94, pls. 3, figs. 14; rev. in Nature [London], 100 (1918), No. 2516, pp. 382, 383*).—This brief popular guide to the practice of manuring, especially as applied to British farming, has been considerably amplified in the present edition from that previously noted (E. S. R., 36, p. 119). There has been added a brief chapter on breaking up of grass-land, a matter which has assumed very great importance in England since the outbreak of the war. The book is based throughout upon the results of experiments in Great Britain with manures and fertilizers, of which it is in fact a very complete summary.

The American fertilizer handbook, 1918 (*Philadelphia: Ware Bros. Co., 1918, 11. ed., pp. [456], figs. 12*).—This handbook contains the usual statistical and other information relating to the fertilizer industry (E. S. R., 37, p. 724). Among the special articles included are the following: Fertilizers and Food Production, by S. B. Haskell; The Use of Lime in Agriculture, by J. H. Voorhees; An Important Soil Type of the South and Its Possibilities, by J. N. Harper; Maintaining Fertility on Fertilizers Alone, by E. G. McCloskey; and The Sulphuric Acid Industry, by A. M. Fairlie.

The fertilizer situation in Egypt, F. HUGUES (*Bul. Union Agr. Égypte, 16 (1918), No. 122, pp. 3-16, pls. 2*).—The need for fertilizers on different types of soil is discussed, as well as the normal requirements and sources of supply and the present shortage. Various local and minor sources of fertilizing materials of different kinds are described.

Chemical analyses of the soils and fertilizer experiments indicate a deficiency of phosphoric acid. Assimilable potash appears to be present in large amounts and the soils are also well supplied with nitrogen. There is marked response by plants to applications of nitrogen, especially in combination with phosphate and potash.

The general conclusion is that fertilizers are indispensable for securing the most profitable crop returns with the methods of culture now practiced. Under normal conditions the largest item of import has been nitrogen, with phosphoric acid second in importance. No potash has been imported.

Fertilizers, A. BAGULEY (*Jour. Chem., Metallurg. and Min. Soc. So. Africa, 18 (1917), pp. 121-132; abs. in Chem. Abs., 12 (1918), No. 10, p. 1095*).—The special needs and sources of supply of fertilizers in South Africa are discussed. Phosphorus is shown to be the element particularly lacking in the soils. Mineral phosphates are widely distributed but occur in large amounts only in one locality. They are used as fertilizer in finely ground condition after calcination with lime or after fermenting with organic matter, the latter treatment giving the better results. The available sources of potash named are ashes of banana trees, Karroo bush, kraal manure, etc., and the feldspars. The use of lime after applications of phosphatic fertilizers is necessary to get the best results.

On the supposed relative unilateral impoverishment of the soil in nitrogen, phosphoric acid, and potassium by various crops; action of the root system of the plants, A. MODESOV (*Zeml. Gaz., No. 8 (1917), pp. 174-176; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 12, pp. 1183-1185; Chem. Abs., 12 (1918), No. 11, p. 1228*).—The author concludes that, although cultivated plants extract fertilizing constituents from the soil in different proportions, the total amounts of nitrogen and phosphoric acid removed

are almost equal, so that there is not a relative unilateral impoverishment in these two elements by the different crops. On the other hand, there are differences in the total quantities of potash removed by crops.

"These facts conflict with the theory commonly held to account for the beneficial effect of crop rotation wherein it is assumed that the soil has become 'fatigued,' i. e., depleted of the available elements required by the particular crop. The increased yield obtained through rotation is attributed to the following: (1) Better physical condition brought about by hoed root crops often used in rotation, which favors nitrification and accumulation of moisture; (2) the difference in the position of the root systems of the crops which allows them to draw their nutriment from different parts of the soil. It is not thought that the total quantity of water taken from the soil by the various crops has any influence on the yield of the succeeding crops. Attention is also drawn to the different dissolving capacities of the roots of the various plants and to De Candolle's theory of soil poisoning."

The continuous growing of wheat and rye with and without a legume as green manure, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stat. Rpt. 1916, pp. 380-383, pls. 2*).—This reports the continuation of work begun in 1912 (E. S. R., 30, p. 325) to determine to what extent the nitrogen supply of the soil can be maintained by growing a legume between the main crops of the rotation.

Wheat grown alone yielded at the rate of 9 bu. of grain and 1,040 lbs. of straw per acre, and wheat following soy beans as a green manure at the rate of 17.33 bu. of grain and 2,540 lbs. of straw. Rye grown alone produced 15.33 bu. of grain and 1,540 lbs. of straw, and following soy beans, 21.66 bu. of grain and 2,780 lbs. of straw. The nitrogen in the dry matter of both the grain and straw amounted to 17.92 lbs. per acre for wheat and 23.15 lbs. for the rye grown alone, as compared with 39.13 and 40.7 lbs., respectively, when grown with soy beans.

The influence of bacteria carried in manure on the decomposition of green manures (legume and nonlegume), J. G. LIPMAN and A. W. BLAIR (*New Jersey Stat. Rpt. 1916, pp. 383-387*).—This notes the continuation of work previously reported (E. S. R., 36, p. 817), comprising a study of the effect of bacteria carried in cow manure upon the decomposition of both leguminous and non-leguminous green manure crops employed in the continuous growing of corn.

The yield of grain was greater on the manured plats than on the check plats, but increasing the amount of manure did not always result in a proportionate increase in yield. The total amount of nitrogen recovered in the crop was greater for the manured plats of both leguminous and nonleguminous green manure crops than for the check plats and increased with an increase in the amount of manure applied. The average yield of grain for the legume section was 38.4 bu. per acre and of stover 3,560 lbs., as compared with 23.2 bu. of grain and 3,613 lbs. of stover for the nonlegume section. Nitrogen recovery was at the rate of 63.58 lbs. per acre for the legume section and 45.57 lbs. for the nonlegume section. The increase in the amount of nitrogen recovered in the crop for the different amounts of manure applied was greater for the non-legume than for the legume section, due to the fact that the check plat of the legume section secured a certain amount of nitrogen from the air, thus diminishing the difference between this plat and the treated plats.

The function of organic matter in the maintenance of soil fertility, C. E. THORNE and J. W. AMES (*Proc. Soc. Prom. Agr. Sci., 38 (1917), pp. 28-32*).—On the basis of experimental work at the Ohio Experiment Station, it is concluded that "(1) the value of manure or other organic matter in the maintenance of soil fertility is limited by the nitrogen and mineral elements contained, (2) the physical improvement of the soil following the use of manure is due not to the

carbonaceous matter of the manure but to the superior growth of plant roots induced by the nitrogen and mineral elements carried by the manure (3) this superior growth may be as readily and effectively obtained by the use of suitable nitrogenous and mineral salts as by manure, and (4) any favorable biological action following the use of manure will also follow that of chemical fertilizers, under ordinary farm conditions."

Peat as a manure substitute, J. S. BURD (*California Sta. Circ. 203 (1918), pp. 10*).—The agricultural value of peat as compared with manures as a fertilizing material is discussed with regard to both its physical and chemical properties, and the conclusion reached that "in the absence of more favorable results than those heretofore obtained in experiments with peat, the use of this material is not advised," and that "the plant food constituents of peat are not to be regarded as having the same commercial value as those of high grade fertilizers, nor is peat commercially or agriculturally as valuable as farmyard manure."

What shall we do with wheat bran? A. D. HOLMES (*Sci. Amer., 119 (1918), No. 6, p. 106*).—This article questions whether the use of wheat bran for food is the most efficient way of utilizing its mineral constituents, and maintains "that in attempting to decide what milling standard should be adopted to utilize wheat most efficiently for human food some attention should be given to the fertilizing value of the mineral constituents of wheat bran." It is estimated that a bushel (60 lbs.) of wheat contains approximately 0.36 lb. of potash and 0.65 lb. of phosphoric acid, four-fifths of which is left in the bran and other by-products in the ordinary milling process.

Characteristics of good nitrogenous fertilizers, E. J. RUSSELL (*Jour. Soc. Chem. Indus., 37 (1918), No. 3, pp. 45R-47R; abs. in Chem. Abs., 12 (1918), No. 10, p. 1095*).—The following order of efficiency is given: Nitrates 100, ammoniacal nitrogen 95, cyanamid nitrogen 85 to 90, and protein nitrogen 70 to 80. It is pointed out that besides being available the fertilizer should contain nothing harmful to plants.

On a test of fertilizers, T. SCHLÖSING (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 18, pp. 714-718; Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 22, pp. 517-519; abs. in Rev. Sci. [Paris], 56 (1918), No. 10, p. 315; Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 8, p. 930*).—In a comparative test of ammonium sulphate and ammonium nitrate on corn grown in pots, it was found that these two sources of nitrogen were about equally effective, especially when the soil was kept very moist.

The influence of the mechanical composition of the soil on the availability of nitrate of soda and dried blood, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stat. Rpt. 1916, pp. 369-380, pls. 3, figs. 3*).—This reports the continuation of work previously noted (*E. S. R., 36, p. 819*) on the relative availability of nitrate of soda and dried blood nitrogen when applied in equivalent amounts to cylinders containing shale soil and various dilutions of shale with sand. Barley was the main crop employed, and buckwheat the residual crop.

The average amount of nitrogen recovered in the main crop for all cylinders with nitrate of soda was 60.64 per cent and with dried blood, 41.23 per cent. In the residual crop there was no recovery of nitrogen from seven of the ten nitrate cylinders, while in no one of the three remaining cylinders did the recovery reach 5 per cent. The average recovery from the dried blood cylinders was 6.27 per cent. With the availability of nitrate nitrogen as 100, that of the dried blood nitrogen was 80.01. Mixing sand with a heavy soil permitted better aeration and drainage and is said to have resulted in a more complete utilization of the nitrogen of the soil organic matter.

A study of the toxic influence of the phosphate salts on soy bean seedlings, J. W. SHIVE (*New Jersey Stat. Rpt.* 1916, pp. 449-454).—This forms a preliminary note on investigations of the toxic effect upon soy bean seedlings of NaH_2PO_4 , KH_2PO_4 , $\text{NH}_4(\text{H}_2\text{PO}_4)$, $\text{Mg}(\text{H}_2\text{PO}_4)_2$, and $\text{Ca}(\text{H}_2\text{PO}_4)_2$ when used singly in varying concentrations and in combination with a complete fertilizer in soil cultures, and when employed in water cultures in connection with full nutrient solutions.

Specific symptoms of poisoning are said to have been evident in the plants of all cultures to which the phosphate salts had been added singly, except in those cultures to which was added the solution having the lowest osmotic concentration (0.5 atmosphere of possible osmotic pressure). The nature of the toxic effects was the same for each series of cultures, indicating that the basic elements of the salts were not the main factors causing injury to the plants. The least amount of injury occurred in the KH_2PO_4 cultures and the greatest amount in the $\text{Ca}(\text{H}_2\text{PO}_4)_2$ cultures, measured by the actual number of injured leaves, the number of fallen and dead leaves, and the general appearance of the plants. The average dry-weight yield of tops ranged from 15 to 94 per cent of the average yield from the control cultures for the $\text{NH}_4(\text{H}_2\text{PO}_4)$ and KH_2PO_4 cultures, respectively.

Where the phosphate salts were used in combination with a complete fertilizer, the injury produced was identical with that noted above, being most severe in those cultures having the highest proportions of phosphate salts and the lowest proportions of the other salts. The maximum dry-weight yield of tops varied from 33 to 58 per cent above the average yield from the checks, while the lowest yields ranged from 35 per cent below to 3 per cent above the check yield. The highest average yields occurred in the corresponding cultures of each series, these cultures being characterized by low relative proportions of the phosphate salts and of calcium nitrate and by high relative proportions of magnesium sulphate.

In the case of the water cultures, the nature of the injury sustained by the plants is said to have been no different from that occurring in the soil cultures, although the number of cultures affected was greater and the injury more severe. The average dry-weight yields ranged from 31 per cent of the average yield obtained from Knop's solution, taken as 100, for the $\text{Mg}(\text{H}_2\text{PO}_4)_2$ culture to 52 per cent above the standard for a control solution having the lowest relative proportions of KH_2PO_4 with medium relative proportions of $\text{Ca}(\text{NO}_3)_2$ and MgSO_4 .

The potash situation (*Rev. Sci. [Paris]*, 56 (1918), No. 12, pp. 371, 372).—This is a brief review of recent contributions to the question of sources of potash in different countries aside from the German potash deposits.

Potash: Its need and sources (*Jour. Dept. Agr. Victoria*, 16 (1918), No. 1, pp. 58-60; *abs. in Chem. Abs.*, 12 (1918), No. 8, pp. 845, 846).—This article discusses briefly the needs and chief sources of potash in Australia, including ashes, seaweeds, wool scourings, brines and saline lake deposits, sugarhouse residues, flue dusts of various kinds, and potash rocks. The most promising source of potash in the country appears to be alunite, of which there are at present three known deposits in Australia. These deposits are briefly described.

The alunite deposits of Australia and their utilization (*Advisory Council Sci. and Indus., Aust., Bul.* 3 (1917), pp. 38, pls. 9).—This is a report of a special committee appointed to investigate these deposits and their suitability for the production of potash. It enumerates the principal sources of potash aside from the German potash deposits, notes the principal occurrences of alunite in Australia and other countries, describes the Australian deposits in detail,

and describes and reports tests of methods of manufacture of soluble potash salts from alunite. Data are also given regarding a working plant and process suited to the manufacture of potassium sulphate from Australian alunite, cost of treatment, use of alunite mixed with lime and of roasted alunite as a fertilizer, and utilization of the alumina by-product.

As a result of laboratory tests of various methods of treatment, the conclusion was reached that ignition and subsequent leaching and evaporation of the solution is the most likely process for adoption in Australia. The principal steps in the process recommended are as follows: "(1) Crush to about $\frac{1}{4}$ in. mesh; (2) roast in a suitable furnace alone, or, preferably, after the addition of molasses or sawdust as described above, until all soluble alumina is absent; (3) grind roasted ore to pass 40-mesh sieve; (4) treat the residue with boiling water and digest; (5) filter-press the pulp and wash with hot water; (6) evaporate the solution to obtain potassium sulphate product; and (7) dry and bag the product for sale."

It is stated that alunite is being utilized as a fertilizer in a small way in Australia by burning with limestone in a limekiln and grinding the product fine. This product, which contains 2.5 per cent potash, "has been proved efficacious where used, particularly in the growth of citrus and other fruits, and is well spoken of as a fertilizer." The opinion is expressed that there is no reason why a similar process should not be used to produce a product containing as high as 20 to 25 per cent of soluble potassium sulphate in combination with lime. "The alunite and lime would need to be ground together and heated in a reverberatory furnace until all the aluminum sulphate was decomposed and the potash rendered soluble. No escape of sulphur fumes should take place under these conditions, and the presence of the lime would be of value where the product is used direct as a fertilizer."

Detailed analytical data, a list of analyses of foreign alunites, and a bibliography of the subject are given in the appendix.

Availability of potash in some common soil-forming minerals.—Effect of lime upon potash absorption by different crops, J. K. PLUMMER (*Jour. Agr. Research* [U. S.], 14 (1918), No. 8, pp. 297-316, pl. 1, figs. 4).—In experiments conducted at the North Carolina Experiment Station, as pure specimens as could be obtained of biotite, muscovite, orthoclase, and microcline, ground to an impalpable powder, were treated with twentieth-normal solution of calcium bicarbonate, containing an excess of carbon dioxide, as follows: "Thirty gm. of each material and 200 cc. of the solvent were placed in 500-cc. flasks and agitated in an end-over-end shaking machine for 96 hours. At the end of this time suspended matter was allowed to settle, the solutions were clarified, and potash was determined colorimetrically, according to methods given by Schreiner and Failyer [E. S. R., 17, p. 831]. The residue was thrown on a filter and washed free of potash, after which it was again extracted as before, and the process repeated four times." For the purpose of supplementing the laboratory data thus obtained pot experiments were made with oats, soy beans, rye, and cow-peas grown on a soil which field tests had shown conclusively to be deficient in potash. The potash-bearing minerals were applied at rates of 200 and 400 lbs. per acre in combination with a basal fertilizer supplying adequate amounts of phosphoric acid and nitrogen and in comparison with potassium sulphate as a source of potash.

"The chief points brought out by this investigation are as follows: Little difference in the solubility of potash in water is found among the common soil-forming minerals: Biotite, muscovite, orthoclase, and microcline. Biotite and muscovite give up considerably more of their potash to solutions of carbonic acid than do orthoclase or microcline. The order in which potash is removed by this

solvent is biotite, muscovite, orthoclase, and microcline. Lime as calcium bicarbonate does not increase the solubility of potash in any of the above minerals.

"Pot experiments which include the growth of four crops—oats, soy bean, rye, and cowpea—that have had potash supplied in the form of minerals show that these plants can extract different amounts of this element from them. Biotite is able to produce four times the amount of dry matter of oats as microcline and 66 per cent as much as potassium sulphate. Muscovite produces nearly twice as much dry matter as orthoclase. The same general effect is caused from these carriers of potash with rye. Lime in the form of precipitated carbonate has not materially increased the dry matter or the potash removed from the soil by oats or rye. The dry matter of soy bean has been increased about 33 per cent when lime was used in conjunction with biotite. There was also a noticeably increased growth from muscovite caused by calcium carbonate. A much smaller increase was found from this material when the potash was applied as orthoclase or microcline. Lime caused the soy beans to remove more potash from the soil with potassium-sulphate, biotite, and muscovite treatments. This should not be taken necessarily to indicate that potash has been driven into solution, but that more favorable conditions for plant growth have been set up in the soil. More vigorous plants are thus produced, plants capable of removing more of this nutrient material. The results from the cowpeas were similar to those with soy beans. Slightly more potash was removed, after two years' cropping, by fifth-normal nitric acid from the pots fertilized with biotite and muscovite than from the control pots. No more potash was removed by this solvent where orthoclase and microcline had been added than from the controls. Lime does not appear to increase the solubility of the soil potash in fifth-normal nitric acid from any of the treatments."

The deterioration of lime on keeping, S. A. WOODHEAD (*Analyst*, 43 (1918), No. 506, pp. 161-165).—From results of investigations on the deterioration of lime under different conditions, the author concludes that, in order to store lime to the best advantage, it should be heaped in a powdered condition and left freely exposed to the air. Serious deterioration is prevented by the crust of carbonate which forms on the outside of the heap.

How often must liming be repeated? C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 236-238, fig. 1).—Observations on the effects of applying 1 ton of quicklime or 2 tons of limestone to corn in a 5-year rotation of corn, oats, wheat, clover, and timothy covering a period of 18 years are said to indicate that the period between limings on such soil as that at Wooster may be extended to 6 or 8 years.

Action of various fertilizers, especially manganese sulphate, on the growth of oats, L. HILFNER and G. KÖRFF (*Prakt. Bl. Pflanzenbau u. Schutz*, 15 (1917), pp. 549-556; *Zentbl. Agr. Chem.*, 47 (1918), pp. 15-19; *abs. in Jour. Chem. Soc. [London]*, 114 (1918), No. 665, I, p. 150; *Jour. Soc. Chem. Indus.*, 37 (1918), No. 6, p. 159).—The authors describe pot experiments in which oats were grown in various types of soils, some of which were treated with iron, copper, or manganese sulphates, or with sulphur, and all received guano.

"The addition of manganese sulphate caused in each case an increase in the size of the plant and in the total number of oat grains, especially in soils containing much humus. In peaty soils, the yield of oat grains was 70 times as great in the presence of manganese sulphate as in its absence. It is suggested that these remarkable results are largely due to the accelerating action of manganese on the oxidation of the guano added to the soil. The other sulphates and the sulphur experimented with produced similar but not such marked results."

Plant stimulation with nonessential elements, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1916*, p. 300).—In both water and soil cultures conducted by P. W. Moore unquestionable stimulation in the growth of radishes, especially of the root system, is said to have been obtained with boric acid and potassium iodid. Boric acid is thought to give considerable promise of practical value in the culture of root crops.

Caliche [in Arizona], A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1916*, pp. 298, 299).—Work with caliche has been continued (E. S. R., 35, p. 511), comprising field and laboratory studies of the organic origin of the material as suggested by previous investigations.

"From its mode of occurrence caliche appears to have been formed by lime-secreting organisms either in water or on surfaces that were frequently wetted with limy waters. During intervals of comparative quiet when little débris was being introduced and there was little interruption to the growth of these organisms the smooth caps [calcareous formations found near the top of the deposits] may have been laid down." Chemical evidence of the organic formations of caliche is said to be less complete, but further work is expected to show the similarity of this material to travertines of known organic origin.

Report on commercial fertilizers, 1917, E. H. JENKINS and J. P. STREET (*Connecticut State Sta. Bul. 204 (1918)*, pp. 371-422).—This contains the actual and guarantied analyses of 625 official samples of commercial fertilizers and fertilizing materials collected during 1917. Analyses of 28 samples of the ashes of household wastes and other materials, for the most part previously noted (E. S. R., 38, pp. 625, 626), are included.

Commercial fertilizers, E. G. PROULX ET AL. (*Indiana Sta. Bul. 215 (1918)*, pp. 3-102, figs. 2).—This reports the actual and guarantied analyses of 919 official samples of fertilizers and fertilizer materials collected during the spring and fall of 1917.

AGRICULTURAL BOTANY.

Some dynamic studies of Long Island vegetation, R. M. HARPER (*Plant World*, 21 (1918), No. 2, pp. 38-46, figs. 2).—During the season of 1916 the author made a study of a few easily accessible types of vegetation on the western part of Long Island, the results of which are given as regards the actual production by each type of fresh, dry, or ash material.

In dry weight Phragmites led the other forms by a considerable margin. The yield of vegetable tissue was in most cases, however, less than that produced by the average cultivated crop in average soils where fertilization is omitted.

Observations regarding alpine species outside their usual habitat, W. VISCHER (*Bul. Soc. Bot. Genève*, 2. ser., 9 (1917), No. 7-9, pp. 462-466).—The author cites cases of plants which in regions more elevated than those to which they are accustomed are more frequently found in sunshine, whereas in their usual habitat they prefer the shade. The possible causes for this change of habitat are discussed. This tendency was not universal.

Mitochondria and the vacuolar system, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 21, pp. 862-864).—Reviewing briefly attempts to identify mitochondria with well-known bodies in plant cells, the author points out differences which he claims to be very definite.

Studies in the permeability of the pulvinus of *Mimosa pudica*, V. H. BLACKMAN and S. G. PAINE (*Ann. Bot. [London]*, 32 (1918), No. 125, pp. 69-85, figs. 5).—Studies made on the pulvinus of the sensitive plant in a small quantity of water in a specially constructed conductivity cell are said to have shown that contraction is associated with an increase in the rate of exosmosis of elec-

trolytes from the pulvinus. The nature of such increase is obscure, but its rate is too small to account for the sudden drop in the turgor of the cells. The loss of turgor is thought to be due to the disappearance or inactivation of a considerable portion of the osmotic content of the cells.

On turgescence and the absorption of water by the cells of plants, D. THODAY (*New Phytol.*, 17 (1918), No. 5-6, pp. 103-113, fig. 1).—The author gives a brief preliminary and elementary exposition of the conditions which govern the equilibrium of a cell with a watery solution and with other cells, illustrating the consequences of such conditions by employing them in some cases considered important.

The conception of the water-absorbing power of plants is analyzed, and some important corollaries thereof are considered.

The imbibitional swelling of marine algæ, J. M. MCGEE (*Plant World*, 21 (1918), No. 1, pp. 13-15).—The author tabulates the data from tests of the imbibitional swelling of *Iridaea laminarioides*, *Gigartina exasperata*, and *G. mamillifera dissecta*, red algæ growing on the rocks near Carmel, Cal. The imbibition of *I. laminarioides* indicates a high proportion of amino acids. *Gigartina*, however, appears to contain an agar-like substance, chiefly in mature fronds. This diagnosis is supported by the results of swelling dried material, which is said to conform to an expectancy of composition based on MacDougal's conclusions regarding the swelling of biocolloids (E. S. R., 35, p. 822; 37, p. 821), these being fully confirmed by the chemical analysis.

The relation of growth and swelling of plants and biocolloids to temperature, D. T. MACDOUGAL (*Proc. Soc. Expt. Biol. and Med.*, 15 (1917), No. 3, pp. 48-50).—The author notes the fact that the varying constitution and water relations of plants may be simulated (E. S. R., 35, p. 822; 37, p. 524) by employment of media artificially prepared from agar and albumin or albuminous derivatives or more successfully from proteins extracted from beans or oats, and presents data on the swelling of such media. The swelling is found to increase in initial velocity and total amount to a maximum between 39 and 46° C. in the mixture if salt is added and to 46° in the unsalted plates. The hydration in question constitutes 97 per cent or more of the volume increases known as growth.

The resistance of plants to wilting, F. CAVARA and ROSA PARISI (*Staz. Sper. Agr. Ital.*, 50 (1917), No. 1, pp. 33-47).—As regards both the utilization of water and the survival of the plants, a number of which were studied, the specific values have shown great diversity.

Effect of loss of water on respiration of plants, V. I. PALLADIN and A. M. SHELOUMOVA (*Izv. Ross. Akad. Nauk (Bul. Acad. Sci. Russ.)*, 6. ser., No. 8 (1918), pp. 801-808, figs. 2).—The authors report experiments carried on through the months of October, November, and December with potato tubers in the resting stage.

Part of this material was exposed to drying in the air at room temperature, with the result that during the first days in spite of a great loss of water the energy of respiration was gradually increased, but the further loss of water caused a distinct lowering of this energy. When the same tubers were immersed in water the respiration was again stimulated for a few days, after which it fell to the normal ratio.

In order to ascertain whether or not the lowering of the energy of respiration is due to the rapid and considerable loss of water, another part of the material was kept in a moist chamber instead of the laboratory room. It was found, however, that the production of carbon dioxide in this latter test differed little from that in the remaining tubers. This is claimed to show that a slight loss of water is sufficient to weaken the energy of respiration. It was not found

possible to establish any definite correlation between the amount of water lost and the intensity of respiration.

The effect of salt concentration on the germination of seeds, J. W. SHIVE (*New Jersey Stat. Rpt. 1916*, pp. 455-457).—Observations are recorded upon the amount of water absorbed by air-dry seeds of beans and corn and upon the germination of the seeds in sand cultures to which had been added solutions of MgSO_4 , KNO_3 , $\text{Ca}(\text{NO}_3)_2$, KCl , KH_2PO_4 , and K_2CO_3 varying in concentration from 0.5 to 8 atmospheres of possible osmotic pressure.

The average percentage of germination for the highest and lowest salt concentrations was practically the same and only slightly lower than that for the control cultures. The amount of water absorbed per gram of air-dry seed was considerably less for the cultures with the highest concentration than for those with the lowest concentration or the control cultures, resulting in retarded germination for the higher salt concentrations. Injury to the root tips occurred in concentrations as low as 2 atmospheres.

A study of physiological balance for buckwheat grown in three-salt solutions, J. W. SHIVE (*New Jersey Stat. Bul. 319 (1917)*, pp. 4-63, figs. 13).—The results are given of an experimental study of the growth of young buckwheat plants in water cultures, comparisons being made with similar studies on wheat plants previously noted (*E. S. R.*, 36, p. 328). The methods of investigation were the same for both kinds of plants, the object of the experiments being to determine the physiological balance of the salt proportions in the nutrient media and the total concentration of the media. Data are given relating to the dry yields of tops and roots, to transpirational water loss, and to water requirements of tops and roots.

The results of this investigation have been noted elsewhere (*E. S. R.*, 39, p. 630). In general, it was found that the different criteria of plant measurements for buckwheat show a greater variety of more clearly defined relations between growth and the properties of the solution in which the plant grew than do the different criteria of plant measurements for wheat.

Effect of different oxygen pressures on the carbohydrate metabolism of the sweet potato, H. HASSELBRING (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 7, pp. 273-284).—In this contribution from the Bureau of Plant Industry, continuing studies on the carbohydrate transformation in the sweet potato (*E. S. R.*, 34, p. 522), the author reports an investigation to determine the effect of oxygen pressures on the carbohydrate metabolism of the sweet potato root.

It was found that under gas pressures of 5 atmospheres or more, sweet potatoes were killed. In the killed tissues starch hydrolysis was greatly depressed or inhibited. Cane sugar was converted by hydrolysis into reducing sugars which accumulated in the root. Starch hydrolysis and cane sugar formation in the sweet potato were found to proceed in the absence of oxygen in the same manner as in air or in an atmosphere of oxygen, indicating that the presence of oxygen is not always a necessary condition for the formation of cane sugar in plant organs. The quantity of material consumed in a given period of time in anaerobic respiration by the sweet potato was greater than the quantity consumed in normal respiration at the same temperature. The actual carbon-dioxid output was also greater under anaerobic conditions. Cane sugar appeared not to be consumed in either process.

Transformations of (the) inulin of Jerusalem artichoke during the resting period, H. COLIN (*Comp. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 7, pp. 305-307).—The author finds that in resting tubers of Jerusalem artichoke inulin is changed partly into saccharose and partly into levulose, the absolute rotary power of which is less than that of inulin.

Formation of zymase in plants, V. I. PALLADIN and V. P. ILLIUVIEV (*Izv. Ross. Akad. Nauk (Bul. Acad. Sci. Russ.)*, 6. ser., No. 4 (1918), pp. 195-198).—The object of the work reported upon was to throw some light on the formation or accumulation of zymase in plants in the presence of substances capable of fermentation. Experiments were conducted with the juice and the mycelium of *Aspergillus niger*. It has been already shown by the work of previous investigators that when glucose is added to the juice of *A. niger* grown in a solution containing sugar, fermentation takes place with the formation of alcohol and carbon dioxid. Quinic acid was used by the authors as a substitute for sugar in a synthetic culture medium, and it gave a most luxuriant growth of the fungus. The juice was obtained from mycelium eight days old, and the quantity of alcohol and carbon dioxid formed was determined.

It was found that when saccharose was added slight traces of alcohol were detected in both the juice and the mycelium. No alcohol was formed by either the juice or the mycelium without the addition of saccharose. There was, however, an appreciable amount of carbon dioxid formed in all portions. Similar experiments with mushrooms (*Psalliota* sp.) gave no alcohol with either glucose or lactose. While the presence of alcohol in a sterile juice of the fungus would be regarded as indicating the presence of zymase, its absence may signify a lack of accumulation of zymase rather than its total absence. The question is not considered settled, as the intermediate products of dissociation and the first products of synthesis of quinic acid in case of *Aspergillus* and mannite in case of mushrooms are not known.

Enzymatic splitting of arginin in the yellow lupine, O. A. VAL'TER (WALTHER) (*Izv. Ross. Akad. Nauk (Bul. Acad. Sci. Russ.)*, 6. ser., No. 13 (1917), pp. 1071-1074).—Exhaustive studies of Schulze (E. S. R., 12, p. 1012) and his collaborators have shown that a considerable amount of arginin, nearly 6 per cent, accumulates in etiolated sprouts of *Lupinus luteus* during a certain period of its growth, but later this original quantity decreases from some unknown transformations. The object of the author's work was to determine the loss in arginin as well as the products of its decomposition. The juice of etiolated lupine plants three weeks old was obtained, and both control and experimental portions were taken from the same lot of the liquid.

The subsequent analysis, however, failed to reveal the presence of arginin in the control portions of the juice. According to the author the explanation of these negative results is that the decomposition of arginin was effected by an enzym so active that the brief period between the extraction of the juice and its boiling was sufficient for its complete hydrolysis. The highly intensive enzymatic splitting of arginin was regarded as worthy of recording. The methods of work are fully described.

Absorption of ultraviolet rays by plants, V. I. PALLADIN and E. R. GRÜBENET (HUBBENET) (*Izv. Ross. Akad. Nauk (Bul. Acad. Sci. Russ.)*, 6. ser., No. 13 (1917), pp. 1007-1036).—A detailed account of experimental work is preceded by an extensive review of the previous investigations concerning the two groups of the ultraviolet rays, those beneficial and those injurious to the organisms. The authors made an attempt to determine the degree of absorption of the ultraviolet rays by different organs of plants, as well as by different compounds contained in plants, and also to show the relation of the absorption of the ultraviolet rays to different cultural conditions of growth. The procedure and the methods of the 21 experiments are fully described. A number of plants, including peas, beans, wheat, cabbage, etc., served as material for these tests. The following conclusions were reached:

Extracts from roots and stems of etiolated plants absorb very insignificant quantities of the ultraviolet rays. The leaf is the organ absorbing the ultra-

violet rays. Besides chlorophyll, other substances in the leaf, which are colorless, absorb the ultraviolet rays. When bean plants are allowed to grow in the light on a 10 per cent solution of saccharose, there are formed in the tips of their etiolated stems substances which absorb the ultraviolet rays.

This work is regarded by the investigators as of a preliminary character only.

Cytological degeneration in epidermal cells of floral organs, A. GUILLIERMOND (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 15, pp. 726-729, figs. 6).—The author gives the results of observations on alterations which take place during the degeneration and death of epidermal cells in flowers of *Iris germanica*. A sort of fatty degeneration of the chondriome is noted in connection with parallel nuclear alterations. This is thought to be of somewhat exceptional occurrence.

The defertilization of flowers by insects, N. E. BROWN (*Gard. Chron.*, 3. ser., 63 (1918), No. 1619, p. 4).—The author, noting that *Euphorbia gorgonis* previously carefully pollinated by him failed to set fruits, records a fact of recent observation that is thought to offer a possible explanation of the failure. One of the Syrphidæ was seen to remove every grain of pollen from both anthers and stigmas of a *Pelargonium*. These flies are thought to feed largely upon pollen.

Inheritance of shortened development in cultivated carrot and beet, L. DANIEL (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 25, pp. 1012-1014).—Having extended the studies previously noted (E. S. R., 37, p. 27), the author found, after carrying out tests with carrot and beet grown at two different places, that variations observed were in part hereditary, also that heredity of development varied with the environment in the first generation. Tendency to vary is specific and is greater in carrot than in beet. Abbreviation of development varies also with individuals and may be associated with unexpected variations showing racial instability.

[Coloration of plants as affected by crossing varieties], K. V. O. DAHLGREN (*Svensk Bot. Tidskr.*, 12 (1918), No. 1, pp. 103-110, figs. 3).—The author gives details of results of crossing varieties within the species *Chelidonium majus*, *Polemonium coruleum*, and *Lactuca muralis* as bearing upon the transmission of characters, chiefly coloration. Anthocyanin coloration of the vegetative portions appears here as recessive.

FIELD CROPS.

Crop centers of the United States, A. E. WALLER (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 2, pp. 49-83, figs. 8).—This paper, a contribution from the botanical laboratory of the Ohio State University, deals with a study of the geography of certain crop centers in an effort to determine the relation that they bear to the climatic and edaphic factors of the region in which they occur. The deductions presented are prefaced by a discussion of the relation of vegetation to evaporation and rainfall and of the relation of climatic origins and climatic and edaphic factors to vegetative centers, including forests and crops. The crops considered include corn, winter and spring wheat, cotton, miscellaneous tame grasses, and wild, salt, or prairie grasses, and their distribution is indicated by maps. The relation of animal production to specific plant production is also briefly noted.

In summarizing, the author states that "the crop centers of the United States agree with the biotic centers. In detail this means that the corn and winter wheat belts correspond to the deciduous central forest and the prairie

climaxes, the tame hay and pasture region to the northeastern evergreen forest, the cotton belt to the southeastern evergreen forest, and so on. The rainfall-evaporation ratio map is useful for the demarcation of these centers because in it are included four factors of climate, namely, relative humidity, temperature of the evaporating surface, and wind velocity as the divisor, and precipitation as the dividend. These four factors are of profound importance to plant growth. Edaphic factors frequently determine the distribution of the cultivated plants. Edaphic and climatic factors, although they may be independent of one another in their operation, sometimes cause the same agricultural practices to be employed. Economic factors modify the influence of climate and soils.

"A fundamental difference between crop plants and the natural vegetation is seen when plants are found beyond their usual centers. The crops are found on the best soils only, since that is their sole chance to compete with other crops for profit. Plant invaders of the indigenous vegetation migrating from their centers can offer competition in the poorest habitats only. In the better habitats the plants belonging to the center are little influenced by invaders. In addition to the exotic crops being given the best fields, further soil modifications are usually introduced. In the extreme cases, climatic as well as soil modifications are practiced. Field plants are then grown on a comparatively large scale under glass or cloth shelter.

"The domesticated animals are grouped about the centers of production of those crops upon which they are most dependent.

"The methods used in studying plant succession have been used here. It is in this field of research that an accurate interpretation of conditions as consequences of the operation of physical forces of the past and present has been made. Migration, including invasion and competition, the latter implying dominance, are the direct results of interaction of climate and soils upon vegetation."

A bibliography of 25 titles is appended.

Electrical stimulation of crops, L. BRKS and O. DAVIS (*Jour. Agr. [New Zeal.]*, 15 (1917), No. 4, pp. 185-190, figs. 2).—The electrical stimulation of crops in New Zealand, as dealt with experimentally in growing tomatoes in the greenhouse and in frost prevention in orchards, is briefly reported.

Decidedly beneficial results are said to have been obtained from the practice. Methods of electrical application to plants are outlined and the commercial returns to be expected under New Zealand conditions indicated.

Spring harrowing of winter crops (*Selsk. Khoz. i L'sov.*, 252 (1916), Nov.-Dec., pp. 15-25, figs. 2).—Marked beneficial results are said to have followed the harrowing of winter cereals (wheat and rye) in the spring after the melting of the snow covering.

[Report of field crops work in Arizona], J. F. NICHOLSON and H. C. HEARD (*Arizona Sta. Rpt. 1916*, pp. 251-269, figs. 3).—This reports a continuation of work previously noted (*E. S. R.*, 35, p. 526).

Experimental work on the Phoenix farm was limited to variety tests with wheat, barley, oats, and flax, and field trials with rye, emmer, spelt, field peas, vetch, chick-peas, and alfalfa. The highest-yielding varieties of cereals, with their respective yields, were as follows: Early Baart wheat, 2,460 lbs. per acre; Beldi barley, 2,580 lbs.; and San Saba oats, 2,900 lbs. The highest-yielding flax varieties were Smyrna and Boulga, with 10.4 and 10 bu. per acre, respectively. In addition, 36 varieties or strains of flax were planted November 8 and December 22 in nursery rows and cultivated. The later planting date in general gave the better results. Growing flax for seed is said to give indications

of being a profitable industry for the irrigated valleys of the State. Single plats of rye, emmer, and spelt yielded at the rate of 1,200, 1,540, and 1,200 lbs. per acre, respectively. Field peas, vetch, and chick-peas failed to give satisfactory results. Alfalfa yielded at the rate of 2.4 tons per acre.

Work on the Salt River Valley farm near Mesa, begun in July, 1915, has consisted chiefly of tests of different methods of Johnson grass control. Intensive cultivation of cotton has given the best results, although other practices, such as winter grains and sheep pasture and cropping to wheat, Sudan grass, alfalfa, and corn, have given satisfactory results.

Corn, beans, field peas, grain and forage sorghums, Sudan grass, and cereals were grown on the Prescott dry farm. The season is said to have been very favorable. Hickory King corn gave the largest yield of green silage, 13,320 lbs. per acre. The small Indian corns are said to appear to better advantage under the less favorable rainfall conditions. Tepary beans were completely destroyed by rabbits, and Colorado Pintos were seriously reduced in yield, producing only 75 lbs. per acre. Canada field peas made an excellent growth of vines, which were turned under as a green manure. Shallu, Standard Black Hulled White Kafir, and Early Dwarf White milo were grown for forage and produced 8,062, 5,182, and 4,000 lbs. of green silage per acre, respectively. A small portion of milo maize left for seed yielded at the rate of 1,260 lbs. of grain in the head per acre. Shallu is deemed to be inferior in quality and its production is not encouraged. Club Top sweet sorghum yielded 11,650 lbs. of green silage per acre when planted May 10 and 11,456 lbs. when planted May 31. Sudan grass seeded in rows 40 in. apart yielded slightly over 1.5 tons of dry hay per acre, as compared with 1,000 lbs. from that seeded in 20-in. rows. All the small grains failed completely. Based on the results obtained on this farm, it was concluded that plowing should be done in the fall or early winter, that spring crops should be sown as early as possible, and that locally-grown seed should be used.

Work at the Sulphur Spring Valley dry farm, similar to that noted above, led to the conclusion that Dwarf Kafir, Mexican June corn, and Sudan grass planted in March on fall-plowed ground; feterita, Club Top cane, tepary beans, cowpeas, and a second crop of June corn planted in July on a previously prepared seed bed moistened by the first rains of the summer; and small grains sown in October on the tepary bean ground would furnish ample feed for live stock and at the same time give a cash crop of beans or wheat.

[Report of plant breeding work in Arizona], G. F. FREEMAN and W. E. BRYAN (*Arizona Sta. Rpt. 1916, pp. 278-280*).—This reports the progress of work conducted at Yuma along the same general lines previously noted (E. S. R., 35, p. 527). The average yield on the experimental wheat plats was 30.9 bu. Alkali reduced the yield to some extent, but in practically no instance did it entirely prevent the plants from maturing seed. The highest-yielding wheat variety on the largest test plat was Early Baart, with 49.46 bu. per acre. In tests of pedigreed races, a selection of Turkey Red wheat produced 51 bu. per acre, as compared with 43.2 bu. obtained from the original stock in 1915.

Hairy Peruvian alfalfa, with a total yield of 17,772 lbs. per acre, was again the leading variety.

Sixty head selections of milo maize, feterita, and Kafir corn were made in preliminary tests of breeding stock, a total area of $1\frac{1}{4}$ acres being planted to the selections. A total yield of 5,758 lbs. of grain was obtained.

[Report of field crops work in New Jersey], F. APP, D. A. COLEMAN, and C. S. VAN NUIS (*New Jersey Stas. Rpt. 1916, pp. 301-325*).—This reports the continuation of work previously noted (E. S. R., 36, p. 829).

Variety tests with corn, oats, barley, and wheat are briefly described, and notes are presented on the yields and on the man and horse labor involved in the production of forage crops, including corn for silage, oats and peas for hay and silage, alfalfa for hay, and timothy and mixed hay. Although analyses of two plantings of Sudan grass indicated that it is not high in nutritive value, for soils of South New Jersey it is deemed an emergency crop which will probably outyield millet.

Work with alfalfa conducted by D. A. Coleman is reported in which alfalfa was seeded with timothy, broadcasted alone, and sown in 36-in. rows. Oyster-shell lime was applied at the rate of 2 tons per acre, together with a mixture of 800 lbs. acid phosphate, 100 lbs. tankage, and 100 lbs. rock salt. The estimated cost per acre for the three methods of seeding was \$21.98, \$21.56, and \$19.15, respectively. Observations on winterkilling indicated that very little alfalfa winterkilled in the alfalfa-timothy mixture, while an actual increase in the stand occurred with the other two methods of seeding. Three cuttings of alfalfa were made, giving total yields for the different methods of seeding of 5,099, 5,800, and 1,980 lbs. per acre, respectively, representing profits per acre of \$30.54 for alfalfa seeded with timothy and \$24.41 for that sown broadcast, while alfalfa seeded in rows was grown at a loss of \$5.05 per acre.

Data are presented showing the relation of the method of seeding to the protein content of the crop harvested at the first and second cuttings. At the first cutting the protein content amounted to 14.76 per cent for alfalfa sown with timothy, 17.23 per cent for that broadcasted alone, and 17.27 per cent for that seeded in rows, while at the second cutting the percentages were 16.87, 19.4, and 16.65, respectively. Timothy grown alone showed a protein content of 4.89 per cent and that grown with alfalfa one of 4.93 per cent. Liming resulted in a protein content of 4.89 per cent for timothy and 17.27 per cent for alfalfa, as compared with 4.06 and 13.81 per cent, respectively, from unlimed areas.

[Field crops work on county experiment farms in Ohio in 1916 and 1917], C. W. MONTGOMERY ET AL. (*Ohio Sta. Bul.* 323 (1918), pp. 244-276, 281-397, 411-451, 455-468, 483-486, figs. 24).—This reports the continuation of work on experiment farms located in Miami, Paulding, Clermont, Hamilton, Washington, Trumbull, and Mahoning Counties along the same general lines as previously noted (*E. S. R.*, 36, p. 829). A similar report on work done in Belmont County during 1917 is also presented. The experimental work included chiefly soil fertility studies embracing crop rotation experiments; fertilizing, manuring, and liming experiments with the different crops grown in the rotations; and variety tests with corn, oats, wheat, and soy beans. The data obtained, together with statistical information relating to the agriculture of each region are presented in tabular form and briefly discussed in separate reports for each county. The results of all the fertilizer experiments and variety tests have also been summarized in tabular form.

Acid phosphate used alone produced a large profit in every case except on the Paulding County soil, while the addition of muriate of potash or muriate of potash and nitrate of soda led either to a reduction in profit or to a loss.

The leading varieties of the different crops tested included Darke County Mammoth, Leaming, Clarage, and Reid corn; Silver Mine, Ohio 6203, Big Four, Sixty Day, and Ohio 6222 oats; Gypsy, Poole, Fultz, Valley, and Mediterranean among the standard varieties of wheat and Gladden, Trumbull, and Portage among the newer sorts; and Elton, Ebony, Ohio 9016, Ohio 9035, and Mongol soy beans.

Results of cooperative experiments in agriculture, C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. and Expt. Union*, 38 (1916), pp. 9-33).—This reports the results

of extensive cooperative experiments with autumn and spring sown crops for the year of 1915-16, including variety tests with wheat, rye, barley, oats, potatoes, emmer, buckwheat, field peas, vetch, soy beans, corn, root crops, and miscellaneous forage and fodder crops, and fertilizer tests with wheat, potatoes, mangels, and rape.

[Report of field crops work in Grenada], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1916-17, pp. 4-8, 10, 11, 16*).—This briefly reports work with miscellaneous field crops with notes on the sugar and cotton industries for the year ended March 31, 1917.

A small-scale experiment in storing seed corn under tropical conditions led to gratifying results.

[Field crops work at the Sirvel Agricultural Station], G. R. HILSON (*Dept. Agr. Madras, Rpt. Sirvel Agr. Sta., 1916-17, pp. 6*).—Fertilizer and cultural tests with rice during 1916-17 are briefly reported. An account of the agriculture of the region is appended.

[Field crops work at the Taliparamba Agricultural Station], H. C. SAMPSON (*Dept. Agr. Madras, Rpt. Taliparamba Agr. Sta., 1916-17, pp. 8*).—This briefly reports work with miscellaneous field crops for 1916-17. An account of the local agricultural conditions is appended.

Alfalfa experiments [in New Jersey], J. P. HELYAR (*New Jersey Stas. Rpt. 1916, pp. 244-248*).—Tests of various strains of alfalfa in different parts of the State are briefly noted and are said to indicate primarily the possibilities and the need of further work along this line. The American strains were found to be superior to those of French, Arabian, or Turkestan origin.

Influence of lime upon the yield of dry matter and nitrogen content of alfalfa, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Bul. 316 (1917), pp. 4-13; Rpt. 1916, pp. 387-393*).—Experimental work covering the period 1914 to 1916, inclusive, on growing alfalfa without lime and with applications of from 0.5 to 2 tons of lime per acre is described.

During 1915 and 1916 the total yield gradually increased from the unlimed plat to the plat receiving the most lime, as did also the average percentage of nitrogen in the dry matter. The total dry matter and the total nitrogen per plat increased from the first to the third year. Of the 213.41 lbs. of nitrogen per acre recovered in the 1916 crop from the plat receiving 2 tons of lime, it has been estimated that from 150 to 175 lbs. was obtained from the air.

Environment of pods and seeds in beans, B. D. HALSTED (*New Jersey Stas. Rpt. 1916, pp. 444, 445, pl. 1*).—Observations upon the sequence of blooms of Early Wonder beans grown in midseason on fairly rich soil are briefly noted as preliminary to a study of the environment of bean pods and their seeds.

Broom corn production in Iowa, C. MCKEE (*Iowa Sta. Circ. 49 (1918), pp. 3*).—The field practices and cultural methods deemed essential to the successful production of the crop in Iowa are briefly described.

Corn among the Indians of the upper Missouri, G. F. WILL and G. E. HYDE (*St. Louis, Mo.: The William Harvey Miner Co., Inc., 1917, pp. 323, figs. 39*).—This is an account of the field practices in corn production, the manner of harvesting and storing the crop, the preparation of corn for food, the traditions relating to its origin, and the corn rites of the upper Missouri Indians.

Numerous varieties of native corn are briefly described, the authors stating that "the work of collecting seed of the old Indian varieties of corn has been very successful; nearly all of the sorts formerly grown by the tribes along the Missouri, from the Platte northward, have been recovered, experimental plantings have been made, and the seed has been rather widely distributed among corn-breeders. The work of breeding and crossing these native corns will now

be taken up again; and it is to be hoped that hardier and heavier yielding varieties for the Northwest may be ultimately produced in abundance."

Cotton spacing experiments, W. E. AYRES (*Arkansas Sta. Bul. 153* (1918), pp. 3-8).—This reports the results of spacing tests with cotton in an effort to determine the best distance between hills, the best number of plants per hill, and the best distance between rows, together with a brief summary of results obtained in similar work in other parts of the South. The following conclusions are deemed justified:

Cotton plants are commonly spaced too far apart for the best results, especially on thin land. Crowding the plants, within reasonable limits, results in earlier and usually in larger crops. On fertile soil, with more rapid growth and larger plants, more space was economically occupied by each plant, and therefore fewer plants were required per acre. On soil capable of producing 1,200 lbs. of seed cotton per acre, in the absence of boll weevil, 15,000 plants are deemed necessary for the best results. Yields tended to increase as the space per plant approached a square, although it was not found economical to have the rows too narrow. On fertile land subject to weed and grass infestation the rows were deemed best 4 or 4.5 ft. wide, while as fertility decreased it was found to be more economical to decrease the width of the rows. Soils requiring rows narrower than 3 ft. for profitable yields should be fertilized or planted to leguminous crops. With hills 18 in. apart on good land 3 plants per hill did not materially reduce the yield. A table is presented showing the number of plants per acre for different spacings ranging from 3 to 36 in. between hills in rows varying from 2½ ft. to 8 ft. apart.

Fifty years of Indian cotton crops, 1863-64 to 1912-13 (*Jour. Roy. Soc. Arts*, 65 (1917), No. 3360, pp. 399-401; *Agr. Jour. India*, 12 (1917), No. 4, pp. 654-657).—Tabular statistics are presented showing the production, home consumption, exports, and imports of cotton in India for the period indicated.

Emmer in South Dakota, M. CHAMPLIN and J. D. MORRISON (*South Dakota Sta. Bul. 179* (1918), pp. 814-822).—Data obtained in cooperation with the U. S. Department of Agriculture are briefly reviewed which are held to indicate that emmer is probably the least valuable of the principal small grain crops grown in the State. It is also stated that its chief value lies in its utilization in crop diversification. Seeding as early as possible in the spring at the rate of 6 pk. per acre is advocated.

A study of Philippine bast fibers, N. B. MENDIOLA (*Philippine Agr. and Forester*, 6 (1917), No. 1, pp. 6-39, pls. 4).—Botanical studies of *Abroma augusta*, *Kleinhozia hospita*, *Melochia umbellata*, *Urena lobata*, *Hibiscus sabdariffa*, *Malachra fasciata*, *M. capitata*, *Triumfetta bartramia*, *Grewia multiflora*, *Columbia serratifolia*, *Pipturus arborescens*, *Sesbania grandiflora*, and *Wikstroemia ovata*; microscopic studies of the structure of their fibers; and observations on their dimensions and tensile strength, the effect of seasonal rettings, and the commercial value of the various fibers have led to the conclusion that the fiber of *P. arborescens* can not be extracted by water-retting, that *S. grandiflora* is not a textile fiber, and that none of the species studied can be profitably grown under the labor conditions and methods of manufacture prevailing in the Philippines at the present time.

Experiment with peanuts. Relation of position in the pod to productivity, B. D. HALSTED (*New Jersey Stat. Rpt. 1916*, p. 446).—Tennessee and Virginia peanut pods containing 1, 2, 3, and 4 seeds were shelled into groups depending upon the position of the seed in the pod, and a plot row containing 10 hills was planted to each set of seeds. The largest yield of pods, 3,337 gm.,

was obtained from the 1-seeded pods, with the basal seeds of the 2-seeded pods second with 2,244 gm.

Fertilizing and cultural experiments with Irish potatoes, T. H. WHITE (*Maryland Sta. Bul.* 215 (1918), pp. 151-174).—This bulletin presents the results of experimental work conducted during the past four years.

In fertilizer tests with early potatoes, the average maximum yields obtained for the three years 1915 to 1917, inclusive, amounted to 256.3 bu. per acre with an application of 200 lbs. each acid phosphate and nitrate of soda and 50 lbs. muriate of potash, as compared with 172.1 bu. for the check. Fertilizers containing from 5 to 7 per cent potash from muriate showed an average increase of 23 bu. per acre over those containing no potash. Observations of the effects upon the stand of different amounts of fertilizers indicated that where the quantity exceeded 400 lbs. per acre, the excess should always be mixed with the soil to avoid injury to the seed piece. Treating the cut seed pieces with various substances resulted in better stands than from untreated seed where either flowers of sulphur, air-slaked lime, raw rock phosphate, or dry Bordeaux mixture was employed, while acid phosphate and wet germicides proved to be injurious.

Ordinary level cultivation as compared with the so-called ridge cultivation practiced in certain sections of Maine resulted in average yields of 223.8 and 205.6 bu. per acre, respectively.

Whole seed pieces of White McCormick about the size of hen eggs produced 269.9 bu. per acre, as compared with yields of 219.8 bu. from similar seed cut into two pieces and 184.9 bu. when cut into four pieces.

Late-dug Irish Cobbler placed in a warm room for about a month before planting sprouted sufficiently so that the plants came up and matured as soon as Maine-grown seed. In a comparison of home-grown August planted, Virginia second crop, and Maine-grown seed of Irish Cobbler, average yields were obtained amounting to 191.8, 195.8, and 173.1 bu. per acre, respectively. Owing to marked differences in yield, however, it is deemed more profitable to grow White McCormick and buy Irish Cobbler seed for early planting. The Virginia second crop or the home-grown August planted seed could be cut so as to plant a greater area than Maine-grown seed, due to the smaller size of the tubers, but this was not regarded as a good practice, since smaller yields resulted from the use of small seed pieces.

Selecting eight different types of White McCormick for three successive years failed to give an increase of the desired types. One hundred selected hills of this variety were grown for four years in a comparison of yields, but no superiority of one selection over another appeared. The average yield of the lightest hills was slightly greater than the average yield of the heaviest hills.

A number of seedlings grown from seed balls of White McCormick are said to include practically all the types which had been sought by selection from the original stock by the hill-selection method, and these are to be used in further efforts to improve the variety.

A seed plat method of potato improvement, O. B. WHIPPLE (*Montana Sta. Circ.* 73 (1917), pp. 71-77).—The author describes the preparation and care of a special plat for growing selected seed potatoes on the farm. In tests made in 1917 with five different varieties, seed selected in a manner comparable to that described produced from 26.8 to 56 per cent more than seed selected in the field at time of digging for tuber characteristics alone.

A "water-potato," D. M. ROSS (*Jour. Agr. [New Zeal.],* 15 (1917), No. 4, pp. 209, 210).—Potato plants have been observed growing in close proximity to water cress near the Rangitikei spring in the Bay of Plenty district, New Zealand, with the tubers from 12 to 18 in. under water. "Water-potato" tubers

grown in field tests with 66 other varieties in 1916 made vigorous growth, the plants having a distinctive foliage and bearing large, blue flowers. The total yield was estimated to be at the rate of about 429 bu. per acre. The cooking qualities were inferior, the tubers having a waxy texture.

It is concluded that "the circumstances surrounding the growth of the tubers in the Rangitikei spring may indicate, if only slightly, a possible reversion of this long-domesticated plant to an ancestral habit."

A golden variety of rye, J. WILLIAMSON (*Jour. Heredity*, 8 (1917), No. 12, p. 568).—Volunteer rye plants with distinct yellow foliage, observed in a neglected field in 1914, were isolated during 1915 and 1916 and gave rise to progeny which "demonstrate that the yellowness of the plants is a true recessive character, and that when yellow plants are grown together a good distance from any green plants, and their seed harvested and sown, their progeny are all yellow." The author suggests that the phenomena may be a case of "dilution" due to some peculiar spacing of the chlorophyll plastids in the tissues of the plant.

Soy beans, T. A. KIESSELBACH (*Nebraska Sta. Bul.* 166 (1918), pp. 1-13, figs. 2).—The utilization of soy beans is briefly discussed and their production in Nebraska described. The Early Yellow is said to be the best early sort for commercial planting, while Habaro is deemed well suited for eastern Nebraska.

The influence of lime upon the growth and nitrogen content of soy beans (vines and roots), J. G. LIPMAN and A. W. BLAIR (*New Jersey Stat. Rpt.* 1916, pp. 393-395).—In connection with similar work previously noted (E. S. R., 35, p. 816; 36, p. 232), additional data are presented showing the effect of lime upon the nitrogen content of six varieties of soy beans, including Cloud, Hollybrook, Manchou, Medium Yellow, Ohio 9035, and Swan. The average weight of tops for all varieties on the limed plats was 21.74 gm. per plant and for the unlimed plats, 15.12 gm. The corresponding root weights were 2.785 gm. and 2.333 gm. The average number of nodules per plant for all varieties was 83.6 for the limed plats and 50 for the unlimed plats. The percentage of nitrogen in the dry matter of both tops and roots was greater for the limed than for the unlimed plats in all varieties except Cloud.

The protein content of soy beans as influenced by associative growth with a nonlegume, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stat. Rpt.* 1916, pp. 395-397).—This is a further contribution to work previously noted (E. S. R., 36, p. 232). Pot experiments are described in which soy beans were grown alone and with buckwheat, barley, and oats, which were also grown alone.

When grown separately, the yield of soy beans was much larger than that of the nonlegumes, and, when grown in association with the latter, the yield of soy beans was slightly more than half the yield when these were grown alone and that of the nonlegumes considerably more than half the yield when grown alone. The percentage of nitrogen in the dry matter of the legume grown in association with a nonlegume was slightly higher than when the legume was grown alone. The nonlegumes, with the possible exception of barley, did not suffer any depression as compared with the same crop grown alone. The average amount of nitrogen recovered by one of the crops grown in association with the other was slightly more than one-half the amount recovered by the same crop grown alone.

[Sugar cane], H. P. AGEE (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Committee*, 1917, pp. 19-24).—This briefly reports the results of fertilizer and variety tests at the Waipio substation for the year ended September 30, 1917, in a continuation of work previously noted (E. S. R., 37, p. 339).

Report on the sugar-cane experiments for the season 1915-1917, J. R. BOVELL and J. P. D'ALBUQUERQUE (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts., 1915-1917, pp. 79*).—Fertilizer and variety tests with sugar cane in Barbados are reported on as heretofore (*E. S. R., 38, p. 135*).

The results of the fertilizer experiments were seriously affected by the presence on the fertilizer plats of the root borer, *Diaprepes abbreviatus*, and the brown hardback (*Phytalus smithi*), and are deemed of little value.

Detailed tabulated data are presented as usual, showing the results of variety tests with sugar-cane seedlings, with plant and ratoon canes, and with selected varieties of sugar cane grown on numerous experimental plats. The leading plant cane variety for the season 1915-1917 was B. H. 10 (12), with an average yield of 50.55 tons of cane per acre. Haw. 146 was second with 48.61 tons. White Transparent and B. 6450, standard varieties, yielded 39.38 and 35 tons per acre, respectively. Of the first ratoon canes tested B. 6450 was first with an average acre yield of 33.51 tons and Haw. 146 second with 33.25 tons. White Transparent gave an average yield of 18.41 tons per acre.

Sweet potato storage, J. W. CARPENTER and L. G. HERRON (*Miss. Agr. Col., Ext. Circ. 18 (1917), pp. 16, pls. 3, figs. 7*).—Approved methods of harvesting and storing sweet potatoes are outlined and the construction of storage pits and of storage houses described in detail. Specifications, including diagrams and bills of material, for the construction of sweet-potato storage houses having capacities of 500, 1,700, and 5,000 bu., respectively, are appended.

Timothy, M. W. EVANS (*U. S. Dept. Agr., Farmers' Bul. 990 (1918), pp. 28, figs. 8*).—This publication embraces a general discussion of field practices and cultural methods employed in growing timothy hay, together with brief notes on storage, cost of production, profits, and seed production.

Timothy production in the Vologda region, L. I. MOIĖAKOV (*Min. Zeml. [Russia], Mat. Organ. i Kultur, Kormov. Ploshchadi, No. 15 (1916), pp. 92, pl. 1, figs. 14*).—This is a comprehensive discussion of the culture of timothy for seed and forage in the Government of Vologda.

It is stated that about 85 per cent of all the timothy grown for seed is produced in clearings in fir and birch forests situated on low sloping ground or in dry valleys. The timothy is always sown with a nurse crop of either winter or spring cereals, including rye, wheat, barley, oats, flax, and buckwheat.

Plan of experiment to determine the effect of crop rotation upon the protein content of wheat, J. S. JONES and C. W. COLVER (*Proc. Soc. Prom. Agr. Sci., 37 (1916), pp. 18-23*).—Briefly reviewing experimental evidence regarding the influence of climate upon protein formation in wheat, the authors conclude that they "do not care to state at this time whether available data justify the conclusion that climate is the most important factor to be reckoned with in wheat improvement from the standpoint of protein content. . . . Five years' data (crops of 1908 to 1912 inclusive) on Palouse Bluestem and Forty Fold grown on the Palouse silt loam with sodium nitrate and other fertilizers indicate, as a result of nitrate application, an increase of protein in the grain ranging from 5 to 21 per cent. . . . Similar data on Red Russian. . . . for the year 1915 indicate a gain of protein of 48 per cent as the direct result of nitrate application." Other data are presented showing an increased protein content in wheat following legumes and after cultivation.

A plan of experimentation for increasing the protein content of northwestern grown wheat is proposed, based upon "the desire to insure for the area of soil that is to be used the greatest possible activity of nitrogen-gathering bacteria and of cultural conditions that will make the fixed nitrogen readily available." Wheat is to be grown after three years of a legume, the latter to include field peas, alfalfa, and red clover, and after thorough cultivation.

Variation and correlation in wheat, with special reference to weight of seed planted, A. C. ARNY and R. J. GABER (*Jour. Agr. Research* [U. S.], 14 (1918), No. 9, pp. 359-392, figs. 8).—Data are presented showing the results of a preliminary study of the size of individual seeds of wheat in relation to the resultant plants. These experiments were made at the Minnesota Experiment Station during 1914 to 1917, inclusive, to aid in a more accurate explanation of similar trials now in progress under field conditions. The study involved careful observations of the reactions to environment of plants grown from accurately weighed seeds of various sizes. The results have been subjected to a statistical interpretation. The variability, both of the seed used and of the resulting plants, is indicated by the use of means, standard deviations, and coefficients of variability, while the degree of relation between the weight of the seed and characters of the resultant plants and the degree of interrelation between characters of the resultant plants are shown by correlation coefficients. Rainfall and temperature data are also included. Marquis wheat was used throughout the experiment, and the seeds were hand-selected, weighed to the fourth decimal place, and planted 4 in. apart in 4-in. rows. Observations were made on 2,048 plants. The conclusions reached have been summarized as follows:

The magnitude of the means for any of the characters studied varied with the environmental conditions. Lower yields of straw resulted from a reduction in number, total length, or average length of culms per plant, and lower yields of grain from a reduction in the number of kernels. With normally developed kernels, low yields were accompanied by a higher average weight per kernel. A reduction in the magnitude of the means was generally accompanied by less variability, although a number of exceptions occurred.

Correlation between weight of seed sown and resultant plant characters at maturity was not high in any instance and is thought to be capable of such modification by environmental conditions that the relation may be slight or obliterated entirely. Correlation between plant characters was modified by environment, the degree varying with the characters considered. An increased yield of kernels was very closely accompanied by an increase in number of kernels, number of culms, and total length of spikes, and was somewhat less closely accompanied by an increase in average weight of kernels per plant, average height of culms, and average length of spikes. A larger number of culms per plant was accompanied by a greater total length of spikes but not by a greater average length of spikes.

Average weight of kernels was substantially and fairly consistently correlated with yield of kernels, and, subject to radical change due to environment, moderately correlated with average length of spikes. With number of kernels the correlation was rather low but always consistent. The average weight of kernels was practically independent of the average length of spikes.

There was a distinct tendency for greater average height of culms to be accompanied by a greater average length of spikes, number of kernels, and higher yield of kernels. Average length of spikes was moderately correlated with average weight of kernels three years out of the four. The correlation between average height of culms and number of culms was always low. There was a distinct tendency for plants of varying height at second leaf to maintain the same relative heights at six weeks, but there was a lesser tendency for this relation to be maintained at maturity.

A list of 17 titles, comprising the literature cited, is appended.

Growing wheat in Kansas, L. E. CALL and S. C. SALMON (*Kansas Sta. Bul.* 219 (1918), pp. 3-51, figs. 11).—This bulletin comprises a detailed discussion of cultural methods and field practices employed in growing the crop in the State

in an effort to indicate practical methods that will make wheat growing more certain by reducing the losses and the cost of production and to suggest means for obtaining maximum yields of the best quality at a reasonable cost. The conclusions reached are based largely on the results of experimental work, conducted at Manhattan, the four substations, and in numerous cooperative tests with farmers throughout the State, most of which has been reported on elsewhere; on the recorded history of wheat growing in Kansas covering a period of nearly 60 years; and on the experience of practical farmers generally.

Wheat, R. L. STEWART (*New Mexico Sta. Bul. 109 (1918), pp. 3-29, pls. 3*).—Methods of growing wheat in both the arid and dry farming sections of New Mexico are described, and some field tests with varieties and with different cultural methods are reported.

The experimental work is said to indicate that in most places in the State so-called spring wheat can be sown in the fall with good success, and that fall-sown wheat usually ripens from a week to ten days earlier than the same varieties sown in the spring. Early Baart and Marquis are regarded as promising varieties. Seeding at the rate of from 60 to 90 lbs. per acre under irrigation and from 30 to 50 lbs. under dry farming is deemed best.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 2 (1918), No. 3, pp. 8*).—Statistical data obtained from the seed surveys of July 1, 1918, are presented in tabular form, including information regarding commercial stocks and exports of vegetable seeds for the United States and commercial stocks and receipts of field crop seeds by geographic divisions. The clover seed outlook, including crimson clover, is discussed, and data are presented showing the estimated acreage, yield, and prices of medium red and alsike clover seed and clover seed prices based on monthly averages for the five-year period 1913 to 1917. Statistics are also presented on the supply of seed wheat, oats, and rye in the cotton belt and on the alfalfa and sweet clover seed situation.

A brief report on vegetable seed crop conditions, supplementing that previously noted (*E. S. R., 39, p. 644*), is given, together with the usual data regarding imports of forage plant seeds permitted entry into the United States.

Grain driers in the United States (*U. S. Dept. Agr., Bur. Markets Doc. 12 (1918), pp. 6*).—A tabular statement is presented showing the location and capacity of grain driers in the United States as ascertained by a survey of elevators equipped with driers on March 1, 1918.

Cooperative experiments in weed eradication, J. E. HOWITT (*Ann. Rpt. Ontario Agr. and Expt. Union, 38 (1916), pp. 40-42*).—The results of cooperative experiments in weed eradication covering a period of 5 years are briefly summarized, and conclusions reached similar to those already noted (*E. S. R., 36, p. 339*).

[Suggestions for the enforcement of the Canadian noxious weeds act] (*Saskatchewan Dept. Agr., Weeds and Seed Branch Bul. 44 (1916), pp. 30*).—This is a general discussion of the provisions of the Canadian seed control act of 1911 (*E. S. R., 27, p. 643*), with special reference to noxious weeds, and contains recommendations as to methods of enforcing the act by local agents.

Approved methods of control are briefly outlined for Canada thistle, perennial sow thistle, Russian thistle, stinkweed, tumbling mustard, wild oats, mustard, and numerous other weeds of more or less importance.

State action for the eradication of weeds and the provision of pure seeds (*Jour. Bd. Agr. [London], 24 (1917), No. 7, pp. 705-712; abs. in Nature [London], 100 (1917), No. 2506, p. 193*).—This is a brief account of the more general measures taken by the governments of British dominions and of foreign countries with the object of eradicating weeds and providing pure seed.

HORTICULTURE.

[Report on horticultural investigations], S. B. JOHNSON (*Arizona Sta. Rpt. 1916*, pp. 275-277).—Notes are given on experimental work on lettuce, beans, sweet potatoes, and eggplants.

Tests of various varieties of lettuce showed that the crisp type of lettuce is more suitable to Arizona conditions than the butter head type. Brief suggestions based on experimental tests are given for producing a good crop of lettuce under Arizona conditions.

In order to determine whether anthracnose (*Colletotrichum lindemuthianum*), would affect beans in Arizona a number of different varieties of beans were grown and seed infected with anthracnose was planted in the middle of the variety block. Subsequent examinations made by J. G. Brown indicated that an organism was present which looked like the anthracnose, but no spores could be developed. After the crop was harvested no cultures could be obtained from the beans produced by the infected seed.

With a view to determining some suitable method of storing small quantities of eggplant eight eggplants were dipped in melted paraffin on October 25, and hung up by the stem. Three of the eggplants soon decayed from a brown rot, whereas the remaining five were in good condition December 16. One of the eggplants cooked at this time failed to show any deterioration in quality, the remaining four were apparently in excellent condition on January 25. These results indicate that the paraffin treatment is a practical one for home use, providing the egg plants are not infected before being coated. It is suggested that rotting of the fruits may be prevented by disinfecting the surface before treatment with paraffin.

Experiments with truck crops, C. W. MONTGOMERY ET AL. (*Ohio Sta. Bul. 323* (1918), pp. 397-409, fig. 1).—A progress report on fertilizer experiments with sweet corn, cucumbers, cabbage, and tomatoes (E. S. R., 36, p. 839), which are being grown on some 36 plats, some of which receive no fertilizer and others receive commercial fertilizer, lime, and manure, both alone and in varying combinations. The results for the seasons 1916 and 1917, including the average results for the three seasons, 1915-1917, are presented in tabular form and discussed.

Although no definite conclusions are derived from the work at this time the data secured indicate that acid phosphate used alone will give higher net gains under prevailing prices of fertilizers and crops than stable manure used alone. Still greater net gains are obtained when acid phosphate is used in conjunction with nitrate of soda and with stable manure or with both. When added to a complete fertilizer, ground limestone has apparently increased the net gain. Limestone has been less useful on tomatoes than on either corn, cucumbers, or cabbage.

[Report of horticultural investigations], M. A. BLAKE and C. H. CONNORS (*New Jersey Stat. Rpt. 1916*, pp. 69-72, 78-108, pls. 4).—A progress report on horticultural investigations in 1916 (E. S. R., 36, p. 837), including also the usual records of blooming dates of various fruits, ornamental trees, and shrubs at the college farm.

Observations made at the experimental peach orchard at Vineland indicate that varieties belonging to the Elberta group, such as Elberta, Early Elberta, and J. H. Hale, start into growth upon the occurrence of the first warm days in winter and are later injured by cold. Such varieties as Reeves also lost as high as 75 to 85 per cent of their fruit buds during the winter. On the other hand, varieties like Carman and Greensboro, which respond less quickly in periods of warm weather, escaped with slight loss.

During the season of 1915 a large number of double peaches were found in the orchard. Some of these are here illustrated and discussed with reference to their origin. Such peaches, it appears, may be developed either from a doubling of the pistil or from the actual development of two complete blossoms on the same stem.

Seedlings resulting from several different peach crosses here listed were planted out in 1916 and a number of new crosses were made. A list is given of seedlings secured from crosses made in 1915.

Extensive experiments with carnations have been in progress at the station since 1912. These include variety tests, breeding, soil, fertilizer, and date of benching experiments (E. S. R., 32, p. 535; 35, p. 240). The large amount of data secured from these experiments have been used as a basis of a study conducted by H. T. Kille and here presented under the general title of Factors Causing the Splitting of Carnation Calyces. Summing up the evidence, the author concludes that "the splitting of the calyces of carnations is influenced by both hereditary and environmental factors; that dull, dark weather and lack of light at certain stages in the development of the bud become active factors in the matter. Differences in type of bench construction, time of placing the plants in the benches and differences in soil mixtures within ordinary limits have had comparatively little, if any, influence in the splitting of the calyces of carnations at the . . . station greenhouses." Certain theories advanced by other investigators on this subject are also noted.

A thesis study entitled Truck Crop Organization in Monmouth County, N. J., by S. I. Horn (pp. 99-108) is also presented. The paper discusses and compares a number of farms in Monmouth County with special reference to the causes of variations in profits which occur, and the retail and wholesale methods of marketing as practiced in this county. The data as a whole show that wholesaling is the better method of marketing, and that the greater profits result from wholesaling when accompanied by a good size of business and efficiency in labor.

[Report on heredity and environmental studies], B. D. HALSTED (*New Jersey Stas. Rpt. 1916, pp. 433-444, 447-449, pls. 9*).—In continuation of previous reports (E. S. R., 36, p. 833), general notes are given on character transmission in certain corn, pepper, and nasturtium crosses, including illustrations of the progeny. Detailed records of the current season's work are not included at this time. Progress in environmental studies with peppers is also briefly reported.

The author concludes, relative to his breeding studies as a whole, that enough data have been gathered to warrant the opinion that the breeder should be keen to observe differences in the direct offspring of the cross and select accordingly, and not delay until the second generation before choosing the parents for future strains. Studies with regard to the best combinations to make between two breeding subjects have shown that frequently one kind does better as the pollinator than as the seed parent. In certain cases, notably with peppers, even though reciprocal crosses are secured, the offspring in one direction are practically sterile. Some evidence has been obtained that indicates the inheritance of partial sterility in corn. Certain ears with isolated grains produced a large proportion of ears with isolated grains and absolute sterility in 25 per cent of the stalks.

Environmental studies with peppers have shown that those plants that are grown in the greenhouse have fruits that differ materially in size and shape from those from the same lots of seed that mature out-of-doors.

Inheritance studies with garden plants, E. J. OWEN (*New Jersey Stas. Rpt. 1916, pp. 457-461 pls. 2*).—In continuation of previous work (E. S. R., 36, p.

838), notes are given on character transmission in F_1 and F_2 garden bean and eggplant crosses, in F_1 and F_2 eggplant hybrids, and in F_1 okra hybrids.

During the past year limitation studies were conducted with peas as well as beans. The data secured indicate that limiting the crop to one pod does not materially affect the number of blooms formed on the pea vines during the season whereas the number of blooms formed on bean vines is greatly increased thereby. This difference is attributed to the short growing season of the pea. The number of seed per pod in three out of four varieties showed an average increase when limited to one fruit. The weight of seed from 1-podded plants was greater in every instance.

Variation and inheritance studies in species of *Cucurbita* and *Datura*, O. C. SCHULTZ (*New Jersey Stat. Rpt. 1916*, pp. 461-463).—Notes are given on obvious character transmission in some F_1 crosses of squashes and gourds, including an outline of similar studies being conducted with daturas. The progeny records secured for the season in the work as a whole are not analyzed in this paper.

The high calcium content of some cucurbit vines, L. K. WILKINS (*New Jersey Stat. Bul. 310 (1917)*, pp. 5-20).—The study here reported was conducted largely to throw some light on the possible value of calcium as a plant food. Data are given showing the calcium content of the vines and fruits of pumpkins, preserving citrons, squashes, cucumbers, and cantaloups. The percentages of nitrogen, phosphoric acid, potash, and magnesium remaining are also reported, together with the crop yields and the estimated removal of plant food per acre. A bibliography of the literature on the subject is included.

These vines were found to have a much higher content of calcium than has been reported for most plants. The calcium content varied at different stages of growth. In no instance was it less than 3 per cent of CaO at the first stage taken, nor did it often fall below 6 per cent at the last stage. On the other hand, the calcium content of the fruits was low, not reaching 1 per cent in any case. The seeds of the fruits average less than 0.25 per cent of CaO.

"In a comparison with the content of N, P_2O_5 , K_2O , and MgO, the percentage of CaO was almost invariably higher than that of any of these materials in the case of the vines. With the fruits the CaO percentage was in every instance lower than the percentage of N and K_2O , and frequently lower than the P_2O_5 , but usually higher than the MgO percentage. The fact of an increase, as the plants approach maturity, of the CaO content in the vines attended by a low percentage of CaO in the fruits, when associated with the fact of a decrease, as the plants approach maturity, of the N, P_2O_5 , and K_2O content in the vines attended by a relatively high percentage of the same in the fruits, would suggest that a relation exists between calcium and one or all of these substances in the life processes of the above cucurbits.

"On an acre basis the weight in pounds of the CaO content of the vines was found to be much greater, as a rule, than that of the N, P_2O_5 , K_2O , or MgO content. The largest amount of CaO was 165.95 lbs. in the case of the Yellow Crookneck squash. The largest quantity of any of the other substances was 70.93 lbs. for K_2O , likewise for the Yellow Crookneck squash.

"With the fruits the weight in pounds on an acre basis showed the CaO content to be low—exhibiting a tendency toward the reverse of the results obtained with the vines. The largest amount of CaO was 10.06 lbs. for the preserving citron fruits. The highest for the other substances was K_2O —62.17 lbs. for the cantaloups. Taking the entire crops, vines and fruits together, on an acre basis, the content in pounds was found in the majority of cases to be greater for the CaO than for any one of the other substances—N, P_2O_5 , K_2O , or MgO."

Greenhouse-grown endive.—A promising low-temperature crop and substitute for lettuce, S. N. GREEN (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 247-250, figs. 2).—A progress report on cultural experiments with endive which were conducted during the years 1917 and 1918. The data secured indicated that endive may be successfully forced under glass at a low temperature, although there are many points to be worked out in its commercial culture and marketing. Consideration is given to types of endive, cultural methods, blanching the crop, length of season, and marketing.

Effect of shading on the fruit of pepper plants, J. W. SHIVE (*New Jersey Stas. Rpt. 1916*, pp. 454, 455).—Experimental methods used in studying the effect of shading on the fruit of pepper plants are described in detail, but no data are given in this report.

The home garden, C. C. STARRING (*Montana Sta. Circ. 75* (1918), pp. 87-118).—A popular treatise of vegetable growing, including specific directions for the culture and management of the common garden crops.

Car-lot shipments of fruits and vegetables in the United States in 1916, P. FROELICH (*U. S. Dept. Agr. Bul. 667* (1918), pp. 196).—A statistical report on car-lot shipments of fresh and dried fruits and vegetables during the calendar year 1916, based on reports to the Bureau of Markets from agents of various carriers. The tables given show the number of carloads of each kind of fruit and vegetable by States, counties, and shipping points, together with the earliest and latest shipping dates.

There were received during the year reports of the shipment of 634,175 carloads, originating or billed at 8,798 railroad stations and steamboat wharves.

Heavy loading of freight cars in the transportation of Northwestern apples, H. J. RAMSEY (*U. S. Dept. Agr., Bur. Markets Doc. 13* (1918), pp. 23, figs. 8).—This publication embraces the results with recommendations deduced from an investigation of apple-shipping conditions in the Northwest during the season of 1917-18, when an unprecedented car shortage existed. The phases discussed include conditions in 1917, temperatures in heavy loads, handling heavy loads under ventilation, fluctuating temperatures in box cars, condition upon market arrival, excessive breakage caused by poor loading methods, relation of heavy loading to distribution, methods of shipping during 1917 season, and recommendations.

Loading American grapes, H. S. BIRD and A. M. GRIMES (*U. S. Dept. Agr., Bur. Markets Doc. 14* (1918), pp. 28, figs. 33).—This publication presents the findings with suggestions resulting from investigations at shipping points in New York and Pennsylvania and in large eastern markets during the season of 1917. The information given is applicable to grape shipping sections in general.

A close study of more than 300 cars of grapes, while they were being loaded or unloaded, showed that crushing caused greater losses in transit than fungus decay. The extent to which crushing will occur in a carload of grapes is governed by type and strength of package, the manner and care used in loading, the height of the load, the construction of the car, and the handling it receives from the railroad. Types of faulty and correct loading are shown in a series of photographs.

Experiments with fertilizers on cranberries, F. P. SCHLATTER (*New Jersey Stas. Rpt. 1916*, pp. 329-343).—A progress report on fertilizer experiments started in 1913 (*E. S. R.*, 32, p. 541). Three annual applications of fertilizers have been made, the last in the spring of 1915. The study included tests of single elements and complete fertilizers on different types of bottom land. The data secured in 1915 are presented in tabular form and discussed.

Briefly summarized, almost universal increases were obtained from the use of fertilizers on sandy bottom land with the possible exception of materials

furnishing potash alone. Mud bottom lands, however, appear to be plentifully supplied with all materials excepting phosphorus. Complete fertilizers and nitrogen, when added to mud bottoms caused rank growth of vines, especially runners, at the expense of fruit production. Generally speaking fertilizers increased the size of the berries, but also increased the amount of rotten berries. Only on the sandy bottoms was the increased weight of salable berries sufficiently great to counteract the loss from rotten berries.

In addition to the usual fertilizer elements some tests were made with lime, copper, manganese, and sulphur. The results are here presented in tabular form, but in view of the small size of the plats the data are not considered conclusive. Increases obtained from the use of burned lime or ground limestone, however, indicate that there may be a limit to the acidity which cranberry soils should possess, and that acid soils may not be so essential for cranberry culture as is popularly supposed.

In view of the abnormally heavy vine growth caused by the fertilizer treatment on a number of plats, it was considered that this treatment had been excessive and no fertilizers were applied in 1916. Most of the vines were pruned back heavily and allowed to use up the reserve supply of plant food in the soil. Yield data are given for 1916, although in view of the disturbing factors of pruning and the unfavorable weather conditions no definite deductions are made with reference to the fertilizer treatments. Work has been commenced by the station with the view of improving cranberry varieties by selection and breeding.

Spoilage of cranberries after harvest, C. L. SHEAR, N. E. STEVENS, R. B. WILCOX, and B. A. RUDOLPH (*U. S. Dept. Agr. Bul. 714* (1918), pp. 20).—This bulletin reports the results of investigations conducted during 1916 and 1917 to determine the causes of losses in cranberries after picking. Field work and storage experiments were carried on in Massachusetts in cooperation with the Massachusetts Experiment Station and also in New Jersey. Studies were conducted in the important markets east of the Mississippi River and laboratory studies of material shipped from different cranberry areas were carried on. The results of the work as a whole are presented in a series of tables and fully discussed. A bibliography of cited literature is appended.

The work as a whole has shown that about 15 per cent of the cranberry crop is lost between the field and the consumer. The losses are due in part to smothering and in part to fungus rots. Losses due to smothering may be prevented by adequate ventilation both in the storage room and in the packages. The berries should not be kept in large piles. Smothering may also be caused by flooding the bog for too long a period, especially in warm weather. Another type of spoilage was due to the natural ripening of the fruit, the process being hastened by high temperatures and reduced by low temperatures.

At least one-half of the spoilage after picking was due to fungus rots, which were much more severe in carelessly picked and handled berries.

"The chief rots which develop after picking are early-rot, caused by *Guignardia vaccinii*; end-rot, caused by *Fusicoccum putrefaciens*; bitter-rot, caused by *Glomerella cingulata vaccinii*; ripe-rot, caused by *Sporonema oryococi*; blotch-rot, caused by *Acanthorhynchus vaccinii*; and soft-rot caused by a species of *Penicillium*. The fungus rots which develop after picking, as well as before, may be largely prevented by spraying with Bordeaux mixture to reduce infection. Improved bog management also increases the vigor of the vines and tends to reduce rot. Cranberries picked and stored or packed wet show more rot than those picked and packed dry; when cooled as soon as practicable after picking and kept at low temperatures they show a great reduction in the

amount of rot. The most favorable temperature for keeping berries is 32° F. Temperatures above 50° produced rapid increase in the development of rots. Berries warmed by being kept in a heated room while being sorted showed an increase in the amount of rot.

"Vented barrels or other vented packages used in distribution gave less rot and other spoilage than tight packages. A comparison of different methods of harvesting the fruit showed but slight differences in its keeping quality. A study of the effect of separating fruit by machines and by hand sorting showed but little difference in the result. All lots developed much more rot than the check. The results indicate that separating and sorting should be delayed until the fruit is to be shipped. Cranberries shipped in the chaff, that is, without cleaning or sorting, and separated and sorted at destination, showed less loss from rot than those separated and sorted before shipment."

FORESTRY.

The use book, a manual of information about the National Forests, 1918 (*U. S. Dept. Agr., Forest Serv., 1918, pp. 168*).—A sixth revision of the regulation and instructions for the use of the National Forests (*E. S. R., 33, p. 541*) prepared for all forest users.

Fourteenth annual report of the State forester [of Massachusetts], F. W. RANE (*Ann. Rpt. State Forester Mass., 14 (1917), pp. 99, pls. 6*).—This is the usual annual report relative to the administration and management of the State nurseries and forests in Massachusetts, including accounts of reforestation work, private cooperative forestry work, utilization of forest products, fire protection work, special activities in wood production to meet the fuel emergency, and the present status of chestnut blight and of the work to control the browntail and gipsy moths. A report by L. O. Howard on parasite work in connection with controlling the gipsy and brown-tail moths is also included (see p. 764).

The importance of seed characteristics in the natural reproduction of coniferous forests, J. V. HOFMANN (*Univ. Minn., Studies Biol. Sci., No. 2 (1918), pp. 25, pls. 12*).—The author here presents the results of investigations relative to the coniferous seeds and their behavior, both in the laboratory and in the field, with special emphasis on the importance of size, vitality, length of time required to germinate, and other characteristics. The field studies were conducted largely at the Priest River (Idaho) and the Wind River (Washington) experiment stations of the Forest Service of the U. S. Department of Agriculture. The results of the investigations as a whole are summarized as follows:

"All forest tree species in forest stands produce sufficient seed to reestablish their own type under favorable conditions, and a change of type or removal of a forest from any area once covered with a forest is due to other factors than production of seed. Species producing large seeds produce comparatively few in number. Seed distribution is one of the important factors controlling the establishment of a forest type.

"In the white pine region of Idaho, reproduction by wind-blown seed can not be depended upon for more than 150 ft. from the seed trees. In the Douglas fir region of the Cascades along the Columbia River, reproduction by wind-blown seed of Douglas fir and its associates can not be depended upon for more than about 300 ft. from the seed trees.

"Germination conditions are often unfavorable in a shaded and cool forest floor, hence seed may lie dormant for long periods. By the removal of a forest,

germinating conditions are improved, and the dormant seed germinates. Moisture is the chief factor in the establishment of the seedling, while temperature is often a more important factor in germination. The size of the seedling during its early life is directly proportional to the size of the seed. A seedling from a large seed becomes permanently established much earlier than a seedling grown from a small seed, hence the former is able to obtain and hold possession of the more unfavorable sites.

"Seed is always present in the forest floor, generally covered with and mixed in a layer of litter and duff. This seed is a source of reproduction following forest fires or logging operations. Some seed while dormant will withstand severe conditions, as shown by chemical tests. Coniferous seeds are known to be viable after two to eight years of storage in the forest floor."

The effect upon the growth of some coniferous seedlings of various conditions of shade and moisture, P. C. KITCHIN (*Ann. Rpt. Mich. Acad. Sci.*, 19 (1917), pp. 337-356, pls. 7).—Tabular data are given showing the growth performance for one season of a large number of seedlings of *Pinus strobus*, *P. resinosa*, and *Picea excelsa*, when submitted to different conditions of shade and moisture. No definite conclusions are drawn in this paper as the experiments were to be continued to determine the mortality rate of the seedlings in the different beds after passing the winter.

The increase in girth of Hevea trees, P. E. KEUCHENIUS (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 7, pp. 407-432, pl. 1).—Girth measurements of a number of Hevea trees were made at a level of about 3 ft. above the ground and coordinated with rainfall data. Results are here presented in a series of tables and charts and discussed.

The study as a whole indicates that the growth curve of Hevea is an alternately rising and descending line. Each year the tree passes through a period of absolute standstill in growth for a longer or shorter time. Rainfall has no influence on the periodicity. The growth depends wholly on the total yearly rainfall.

Robusta coffee as a companion crop retards the growth of Hevea somewhat. With Robusta coffee as a companion crop an increase in girth of 8 cm. (3.1 in.) per year may be expected in the district of the Besoeki Experimental Station at an altitude of 1,800 ft. At this rate of growth the trees become tappable after 5 years. At an altitude of 2,800 ft., however, Hevea is only tappable after 8 years.

Rubber tapping experiments, 1917-18, W. G. FREEMAN (*Bul. Dept. Agr. Trinidad and Tobago*, 17 (1918), No. 2, pp. 88, 89).—In continuation of a previous paper (*E. S. R.*, 36, p. 45), the results for the season 1917-18 of tapping experiments with Para rubber conducted at the St. Clair Experiment Station are given.

During the past three years alternate-day tapping has given somewhat better average results than tapping every fourth day, and much better results than tapping every sixth day.

Influence of heavy tapping on latex and rubber, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 7, pp. 437-455, fig. 1).—In the experiments here reported the rubber content of the undiluted latex decreased materially as a result of heavy tapping. The specific gravity rose rapidly, but the tensile strength of the rubber remained constant. The standard time of cure decreased considerably, the slope or type of rubber increased somewhat, and the viscosity decreased somewhat, then rose again. The state of equilibrium, reached 6 to 10 weeks after opening the tapping cut, and in which rubber content, specific gravity, and inner qualities of rubber showed only small daily variations, was not maintained for a long time. Such factors as the seasonal decrease in pro-

duction, interruptions in regular daily tapping, and shallow tapping diminished the stress put on the trees, brought about a higher rubber content in the latex, a lower specific gravity, and a slower curing rubber.

The viscosity of plantation rubber, its relation to the properties after vulcanization, and its significance in rubber testing, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 7, pp. 456-487, figs. 3).—A discussion of the viscosity of plantation rubber and its relationship to other properties, based upon data secured during the author's various testing and research studies with rubber.

American sumac: A valuable tanning material and dyestuff, F. P. VEITCH and J. S. ROGERS (*U. S. Dept. Agr. Bul.* 706 (1918), pp. 12, pls. 5).—Investigations conducted by the Bureau of Chemistry, with a view to the betterment of the conditions of collection and the improvement of the quality of American sumac, indicate that the reestablishment of the sumac industry in this country on a firmer basis is entirely possible, and is specially desirable at this time, when the importation of Sicilian sumac is restricted by difficulties of transportation. American sumac, if properly handled, will make an excellent substitute for Sicilian sumac.

This bulletin deals with the characteristics and distribution of species of American sumac, present methods of gathering and curing, tannin content of American sumac, sumac extract, disposal of extracted material, causes of poor quality in sumac, cooperation for better sumac, directions for proper gathering and curing of sumac, and buyers of sumac.

DISEASES OF PLANTS.

Most common diseases of the year, M. T. COOK (*New Jersey Stat. Rpt.* 1916, pp. 567-575).—The more common diseases of different plants observed in New Jersey during the season of 1916 are listed, with brief notes in some cases.

Administration report of the Government mycologist for the year 1916-17, W. McRAE (*Rpt. Dept. Agr. Madras*, 1916-17, pp. 64-66).—In an account of the bud rot of palmyra palms in the Godavari and Kistna districts, the total number of dead and infected trees shows a decrease since 1914. The percentage of recovery is high. The disease does not appear to be increasing on the west coast.

A plan for dealing with the leaf diseases of coconuts in Cochin State consists in spraying the young leaves during the monsoon with Bordeaux mixture and manuring the trees to compensate for the reduction of green leaf surface.

Experiments in progress in the course of a comparative study of the Phytophthora on *Hevea brasiliensis* and *P. faberi* on cacao pods have been hindered by the dry weather, which is unfavorable to the fungus.

Investigations of a root disease of coffee in the Nilgiris showed the presence near the stem base of *Fomes australis*, which was also present on dying and dead *Grevillea robusta* and on dead *Citrus aurantium*.

Successful measures taken against the outbreak of brown blight of tea (*Colletotrichum camelliae*) consisted in liming and forking the infected fields, picking off and destroying the infected leaves, and spraying the bushes three times with Bordeaux mixture. The succeeding season showed a marked improvement in the character of the wood and in the foliage.

[Plant diseases in New South Wales], G. P. DARNELL-SMITH (*Rpt. Dept. Agr. N. S. Wales*, 1917, p. 30).—Brown rot (*Monilia fructigena*) was prevalent during the summer of 1916-17, owing to the wet weather. Preliminary experiments on the treatment of fruit in boxes with fungicidal gas gave indications of success. Wheat rust (*Puccinia graminis*) lowered considerably the yield of

wheat in many districts. Tomato leaf spot (*Septoria lycopersici*) was very prevalent. Grape black spot (*Glœosporium ampelophagum*) was common, but can be controlled with dilute sulphuric acid. A wilt disease of tomato is supposed to be due to a root bacterium, *Bacterium solanacearum*. A serious disease of lemons, said to be due to *Pythiacystis citrophthora*, has been controlled by burning the refuse left after juice extraction.

New or little known fungi of the Madrid Botanic Gardens, R. GONZÁLEZ FRAGOSO (*Trab. Mus. Nac. Cien. Nat. [Spain], Sed. Bot., No. 12 (1917), pp. 99, figs. 7*).—A considerable proportion of the numerous fungi here systematically presented are provisionally described and named as new species. Indexes are given of both the fungi and their hosts.

New Japanese fungi. Notes and translations, II, III, T. TANAKA (*Mycologia*, 9 (1917), Nos. 4, pp. 249–263; 6, pp. 365–368).—Continuing the series previously noted (E. S. R., 38, p. 648), the author lists as new species *Phytophthora allii* on *Allium fistulosum*; *P. melongenæ* on *Solanum melongena*; *Zukalia nantœnsis* on *Thea sinensis*; *Massaria phorcioides*, *M. mori*, *M. moricola*, and *M. japonica* on *Morus alba*; and *Mycospharella horii* and *Phyllosticta citricola* on Citrus.

A new Sclerotium disease of lawn grasses, A. V. OSMUN and W. S. KROUT (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 72).—From field and greenhouse observations and laboratory studies on the so-called burning out of lawns and putting greens, the authors describe a Sclerotium disease of various lawn grasses, blue grasses, redtops, and white clover, as well as undetermined species in lawn mixtures found diseased in the field. Artificial inoculation was also accomplished on a number of other grasses, as well as on clovers, sweet clovers, alfalfa, and vetch.

Formaldehyde treatment is said to have given control in the greenhouse.

Grain mildew (*Sclerospora macrospora*) in the Government of Podolia, Russia, L. GARBOWSKI (*Bul. Trimest. Soc. Mycol. France*, 33 (1917), No. 1–2, p. 33; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 9, p. 1320).—*S. macrospora* was observed near Felszlyn, in the western part of the Government of Podolia, attacking maize plants not over 15 cm. (5.8 in.) in height. The dimensions of the oospores, which developed in the brown patches on the lower leaves, appeared to depend upon the amount of space allowed to them. Neither the mycelium nor conidiophores were found in the leaves of the dead plant.

Report on diseases of celery, W. S. KROUT (*New Jersey Stas. Rpt. 1916, pp. 584–603*).—This report describes the work done by the station on the principal celery diseases of the State, the investigations being undertaken to determine simple and economical ways of destroying diseases of celery seedlings in the greenhouse, methods of controlling crown rot and of spraying for early and late blight, and the factors involved in the spreading of the blight organisms and in their overwintering.

Complete control of hothouse soil organisms pathogenic to celery was obtained by removing the old soil and spraying the house with Bordeaux mixture, after which clean soil was placed in the benches and treated with formaldehyde. Old soil treated with formaldehyde also gave good results. Steam sterilization gave practically seven-eighths control for crown rot organisms. Among a number tried, formaldehyde, copper sulphate, calcium chlorid, and ferrous sulphate were the only chemicals that showed any germicidal effect for crown rot. In case the soil is treated with formaldehyde, at least 13 days, it is stated, should intervene between the time of application and the date of setting the plants. The best control of *Cercospora* and *Septoria* blights was obtained with Bordeaux mixture of the formula 5:6:50 and with the proprietary preparation Kil-Tone

10:50. The *Cercospora* blight is said to occur in the early part of the year, reaching its maximum only during moist, hot weather, while the *Septoria* grows best during cool, moist weather.

Some important clover diseases in Ohio, W. VAN PELT (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 239-243, figs. 2).—Popular descriptions are given and suggestions offered for the control of anthracnose diseases due to *Colletotrichum trifolii* and *Glæosporium caulivorum*, leaf spot caused by *Pseudopeziza trifolii*, stem rot or root rot (*Sclerotinia trifoliorum*), and clover rust (*Uromyces trifolii*).

Relation of cryptogamic diseases to [cotton] yield, S. C. HARLAND (*West Indian Bul.*, 16 (1917), No. 3, pp. 197-199+4, pl. 1).—The most serious diseases of cotton in St. Vincent are said to be the internal boll disease, the external boll disease, and the soft rot or *Phytophthora* disease. These are briefly discussed as regards their phenomena and effects and protection against attacks.

Internal disease of cotton bolls in the West Indies, W. NOWELL (*West Indian Bul.*, 16 (1917), No. 3, pp. 203-235, fig. 1).—Giving the facts and conclusions thus far derived from an incomplete study of the staining and rotting of lint in unopened and apparently healthy cotton bolls in the West Indies, the author outlines the nature of the trouble so far as known, also the related literature.

The trouble appeared in 1902 and has spread until it now extends from Jamaica through the Lesser Antilles to British Guiana. Fungus attack is more prominent, ordinarily, than that due to bacteria, which may, however, under conditions apparently connected with wet weather, be greatly increased. The incidence of the disease varies with the relations between time of planting, length of crop period, and the time of infestation by cotton stainers (*Dysdercus* spp.). These insects extend their activities to cotton fields from waste land containing wild plants upon which they feed. It is not known how infecting organisms are carried over from one season to the next.

Notes on the resistance of onions to anthracnose, J. G. WALKER (*Abstr. in Phytopathology*, 8 (1918), No. 2, pp. 70, 71).—In a previous publication (*E. S. R.*, 37, p. 841), attention was called to the susceptibility of white onions to the anthracnose organism, the red and yellow varieties being decidedly resistant. Greenhouse experiments show that the fungus is able to cause damping-off of all varieties alike. The coloring matter in the red and yellow varieties is easily extracted in water, and experiments have shown that it inhibits the normal germination of the spores of the anthracnose fungus. There appears to be a close correlation between coloring matter, inhibition of germination, and resistance.

Control of neck rot and anthracnose of onion sets, J. C. WALKER (*Abstr. in Phytopathology*, 8 (1918), No. 2, p. 70).—A report is given of experiments performed in the fall of 1917 to determine the effect of artificial curing of onions to prevent loss from neck rot, which is especially destructive to white varieties.

In the different experiments, artificial drying was found to reduce greatly the loss from neck rot, from 48 to 72 hours' drying seeming sufficient to control the disease satisfactorily in most cases. Anthracnose of onions, which usually starts about harvest time and increases rapidly in the curing crates during moist weather, was also found in some cases to be materially checked by artificial drying.

A preliminary report on a late blight resistant strain of potato, S. ITO (*Ann. Phytopath. Soc. Japan*, 1 (1918), No. 1, pp. 5-9, fig. 1).—Though the potato in Japan is subject to injury also from early blight, wet rot, dry rot, brown rot, rosette, scab, sprain, and filolite, late blight is regarded as more destructive than any of these diseases. Work carried on at the Hokkaidō Agricultural Ex-

periment Station during several years in collecting and testing material has resulted in the separation of a resistant strain, which is described (under the native name Ekishirazu) as regards its qualities in other respects. Experiments in the improvement of this strain are to be carried out at the station.

Report of potato spraying experiments, H. C. LINT (*New Jersey Stas. Rpt. 1916, pp. 604-617*).—An account is given of cooperative spraying experiments for the control of the more common fungus and other diseases and insect enemies of the potato. Previous experiments have shown an increase of about 30 bu. per acre due to spraying with Bordeaux mixture.

From the experiments of 1916, which are described at length, it appears that favorable results were obtained by spraying Irish Cobbler with Bordeaux mixture. Differences are noted in the response of different varieties to fungicides, and this is considered an important contributing factor in the success or failure of spraying. In general, commercial sprays have given about as satisfactory results as standard homemade Bordeaux mixture. Sulphur-lead arsenate has not proved so effective as Bordeaux mixture, but the cost of dusting is only about half that of spraying with homemade Bordeaux.

Report of the sulphur-potato scab experiments, 1916, H. C. LINT (*New Jersey Stas. Rpt. 1916, pp. 618-625*).—Cooperative experiments for the control of potato scab (*Actinomyces chromogenus*), begun in 1914, have been continued as previously outlined (E. S. R., 36, p. 848). In general, the experiments have been very satisfactory, and, as in the three years during which they have been running, quite different climatic conditions have been experienced, the degree of consistency in the results is thought to warrant rather wide generalization in the use of sulphur.

Broadcasting the sulphur, apparently the most efficient method of application, in most of the experiments resulted in an increase in the yield. The application of sulphur a second season brought about a decrease in the amount of scab and also a decrease in yield. This second-year influence of sulphur in the control of scab is said to be very perceptible.

Seed and soil treatment for the control of potato scab, H. C. LINT (*New Jersey Stas. Circ. 95 (1918), p. 4, fig. 1*).—The results of three years' experiments in the control of potato scab are briefly given.

The author claims that the most logical method of eradicating scab, as indicated by the experimental work described, lies in the combined use of seed, soil, fertilizer, and cultural treatments which are known to inhibit the development of the causal organism. Cover crops grown in connection with potato culture have not only shown a reduction in the amount of scab but an increase in the production of potatoes. Sulphur applied to the soil was found more effective when used in connection with a cover crop than without. For seed treatment formalin and corrosive sublimate have both given satisfactory results, but as corrosive sublimate is more effective than formalin against black scurf, or *Rhizoctonia*, this treatment is considered preferable. The application of sulphur at the rate of 300 lbs. per acre is said to reduce the amount of scab without decreasing the yield or injuring the crop-producing power of the soil.

Potato seed treatment, R. E. VAUGHAN and J. W. BRANN (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 70).—The author states that, in treating seed potatoes with mercuric bichlorid solution (1:1,000), chemical analyses immediately after each treatment showed a progressive weakening of the solution. The weakening was more pronounced where the tubers were excessively dirty. At harvest, a much greater amount of scab (*Oospora scabies*) was present on the tubers from untreated seed.

Resistance of sorghum types to covered kernel smut, A. A. POTTER and L. E. MELCHERS (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 71).—A series of tests has been conducted with all the commercial types available of *Sorghum vulgare* to determine their resistance to covered kernel smut (*Sphacelotheca sorghi*).

None of the varieties proved to be immune, although some of the durras, and also a dwarf kaoliang, showed little of the disease. Broom corn, Kafir corn, and varieties of sweet sorghum were found generally susceptible, as were also many of the varieties generally classed as durras. Kaoliang varieties have shown a moderate degree of resistance.

Root disease of sugar cane (*Dept. Agr. Mauritius, Leaflet 5* (1918), pp. 4).—This leaflet deals with the widespread root disease which is said to be associated with a fungus (probably due to *Marasmius* sp. or *Ithyphallus* sp.). The effects of the disease and remedial measures therefor are briefly discussed.

Tomato spraying experiments at Salem, N. J., W. H. MARTIN (*New Jersey Stas. Rpt. 1916*, pp. 575–583, fig. 1).—A report is given of spraying experiments for the control of the disease of tomato due to *Septoria lycopersici*. These experiments included field tests in which applications of Bordeaux mixture of varying strengths were made.

While none of the spray materials gave complete control, Bordeaux mixture gave increased returns, regardless of the time of application or the strength of the spray. As a result of the tests, it is considered that the best method of application is one or more treatments in the seed bed, followed by applications every week or ten days in the field, the early sprays being the more important. Fruits from sprayed plants had a better color and firmer texture than those produced by unsprayed vines, and while the spraying had no influence on the time of ripening, the sprayed plants remained vigorous much longer than the unsprayed ones.

Leaf blight of the tomato, M. T. COOK and W. H. MARTIN (*New Jersey Stas. Circ. 96* (1918), pp. 4, fig. 1).—As a result of investigations for the control of leaf blight due to *Septoria lycopersici*, the authors recommend burning the old plants, deep plowing, rotation of crops, and spraying. The best results have been obtained from spraying with Bordeaux mixture to which resin fish-oil soap was added. The sprayed plants are said to hold their foliage longer and to produce more fruit than unsprayed ones. In addition, the sprayed plants, having more foliage than the unsprayed ones, give better shade, which prevents sunburning and scalding of the fruit. The fruit from the sprayed plants is also considered better in color and flavor than that from unsprayed plants.

Arkansas peach diseases, J. A. ELLIOTT (*Arkansas Sta. Bul. 149* (1918), pp. 3–9, pls. 5).—Popular descriptions and suggestions for control are given of the more important peach diseases that have been observed by the author to occur in Arkansas. The serious peach diseases occurring in the State are said to be brown rot, black spot or bacteriosis, scab, leaf curl, crown gall, dieback and sun scald, root rot, and wood rots.

Peach yellows and little peach at Vineland, M. A. BLAKE and C. H. CONNORS (*New Jersey Stas. Rpt. 1916*, pp. 72–74).—In continuation of previous reports (E. S. R., 36, p. 849), an account is given of peach yellows and little peach in the experimental orchards at Vineland, N. J. Loss due to these diseases is said to have been very heavy throughout the State, but the progress of the two diseases in the orchards under examination was not very rapid. No tree that has been replanted where a diseased tree had been removed has as yet become diseased, although some trees were planted as early as 1910.

Quince rot, F. E. KEMPTON and H. W. ANDERSON (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 71).—An account is given of an investigation of a pale rot of quince similar to that previously reported by Halsted (E. S. R., 4, p. 656).

Fruit decay by this rot first gives a grayish appearance, later purplish, and then brown. The fungus causing the rot was isolated, and inoculation on the fruit caused a rapid rotting identical with that observed on quince in the market.

Some diseases of the fig, J. MATZ (*Florida Sta. Bul.* 149 (1918), pp. 10, figs. 5).—A brief description is given of the diseases of fig which commonly occur in Florida and other Gulf States, in order to arouse interest in their control or eradication wherever possible.

Among the diseases described are anthracnose (*Glomerella cingulata*), leaf blight (*Rhizoctonia microsclerotia*), fig rust (*Physopella fici*), root knot (nematode), sclerotium blight (*Sclerotium rolfsii*), limb blight (*Corticium salmonicolor*), dieback, and dropping of fruit.

Grape stocks in Sicily, F. PAULSEN and MAGGIONI (*abs. in Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 48, pp. 537-545; *Rev. Sci. [Paris]*, 56 (1918), No. 2, p. 53).—In what is said to be a résumé giving conclusions from a report of work done by the authors, it is stated that the resistance to chlorosis by grape stocks imported from France into Sicily is greater in the latter than in the former country, due supposedly to differences in climatic, soil, and other conditions, which are discussed. It is thought that these stocks might show the same resistance to chlorosis in Algeria, which presents much the same environment as does Sicily.

A study of court noué as affected by grafting, E. PANTANELLI (*Staz. Sper. Agr. Ital.*, 50 (1917), No. 3-5, pp. 167-224, pls. 3).—Extended study has been made of the effects of grafting as regards the transmission of court noué. In some cases transmission appeared to depend upon the relation between shoot development and the condition of the root system.

Susceptibility and resistance to citrus canker of the wild relatives, citrus fruits, and hybrids of the genus *Citrus*, G. L. PELTIER (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 9, pp. 337-358, pls. 4).—An account is given of cooperative investigations, carried on between the Alabama Agricultural Experiment Station and the Bureau of Plant Industry of this Department, in which inoculation experiments were carried out in a greenhouse on a large number of species, varieties, and hybrids of the genus *Citrus* to determine their susceptibility or resistance to citrus canker, due to *Pseudomonas citri*. The conditions under which the experiments were carried out were such that a maximum amount of infection was possible.

Results of the inoculations with young plants indicated that citrus canker was apparently limited to those plants having edible fruits with stalked pulp vesicles of the subtribe Citrinæ. All of the species and varieties of *Citrus* tested are susceptible to canker. *C. nobilis* with its many varieties and types, the Kansu orange, and possibly *C. mitis* exhibit enough resistance to warrant trials under citrus-canker conditions in the field. Great variation was observed in the behavior of citrus hybrids toward citrus canker, some of them showing considerable resistance. Susceptibility and resistance to citrus canker was found to follow closely the botanical classification of this group as worked out by W. T. Swingle of this Department.

From the results of the experiments, the author is led to the conclusion that the virulence of the organism can be increased or decreased by choice of hosts, just as the growth of the organism can be influenced on artificial media by giving it favorable or unfavorable media on which to develop. It is thought probable that there may be in nature different strains of canker organisms, but that these can be increased or decreased in virulence by the use of a susceptible or resistant plant, so that the question becomes one of host relation.

Treatment of gummosis with carbolineum, C. C. MILLER (*Mo. Bul. Cal. Com. Hort.*, 7 (1918), No. 8, pp. 488-493, figs. 4).—The purpose of this article is to report a treatment of lemon trees with *Avernarius carbolineum* for gummosis. This is said to be produced by two distinct fungi, *Pythiacystis citrophthora* and *Botrytis vulgaris*, the former being much more difficult to control than the latter, especially in young trees.

Carbolineum has been shown to penetrate broken surfaces and destroy the fungus causing gummosis, though it has some drawbacks, one of which is said to be that it is a German product. The advantages and disadvantages of Bordeaux mixture and corrosive sublimate are discussed.

Fungus blights of tea in northeast India during the season 1916 (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, No. 2 (1917), pp. 62-65).—A brief report is given regarding the presence in certain districts or localities of the blister blight (*Exobasidium vexans*), copper blight (*Laetitia camelliae*), brown blight and dieback (*Colletotrichum camelliae*, *Glaeosporium* sp., and *Glomerella cingulata*), gray blight (*Pestalozzia* sp.), rim blight (*Alternaria* sp. and physiological causes), canker (*Nectria* sp., mechanical injuries, insects, etc.), red rust (*Cephaleuros virescens*), thread blight (a sterile mycelium), and root diseases (*Hymenochaete noxia*, *Ustilina zonata*, *Thyridaria tarda*, and *Rosellinia bothryna*).

A new anthracnose of *Euonymus japonica*, T. HEMMI (*Ann. Phytopath. Soc. Japan*, 1 (1918), No. 1, pp. 9-15).—The author gives an account of a disease of *E. japonica*, said to be caused by a fungus which is considered a *Glaeosporium*, but probably of no species previously known. It appears to be an active parasite, attacking unwounded leaves of this plant, also of *E. radicans*. The author describes the organism as a new species under the name *G. euonymicolum*.

Dry rot of gladiolus, L. M. MASSEY (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 71, 72).—The author states that dry rot is one of the most common corm diseases of gladiolus. The corms become infected in the field and in storage many are reduced to dry mummies. No spores of the causal organism have been found, but numerous small sclerotia are found on diseased plants which are readily formed in cultures. At present the author refers the organism to *Sclerotium*.

White pine blister rust (*The Committee on the Suppression of the Pine Blister Rust in North America*, 1918, pp. 40).—This bulletin is a compilation by H. A. Reynolds of the brief statements furnished by workers in various States and Provinces in response to an inquiry instituted by The Committee on the Suppression of the Pine Blister Rust in North America at the conference held in Pittsburgh November 12-13, 1917.

The outlook is regarded as anything but encouraging. In every State where the disease has gained a real foothold, it has spread with great rapidity, indicating a long and expensive application of control measures. Effective control work is expected to require the combined efforts of the Federal and Dominion Governments, the States and Provinces, and also of local communities and owners producing white pine.

The territorial division of the problem, as stated previously by H. Metcalf (*E. S. R.*, 36, p. 454), is said to remain unchanged. The situation west of the Mississippi River remains hopeful, and the same is measurably true of the territory between the Mississippi River and the Hudson River. East of the Hudson, the situation, it is stated, could hardly be worse, infection of *Ribes* (the more apparent phase of the disease) being general in this section. Massachusetts is most seriously infected. It is considered probable that the white pine blister rust is here to stay.

Results of scientific investigations during the previous season are summarized.

Abnormal leaf fall of Hevea, W. McRAE (*Planters' Chron.*, 12 (1917), No. 39, pp. 487-490, fig. 1).—Reporting further on the *Phytophthora* disease of Hevea previously noted (E. S. R., 38, p. 554), the author states that the preventive measures tested, which consisted in the destruction of diseased branches and fruits, have been measurably successful in keeping down the disease.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Smaller mammals of North America, E. W. NELSON (*Nat. Geogr. Mag.*, 33 (1918), No. 5, pp. 371-493, figs. 88).—In this paper 65 small mammals are dealt with. Colored illustrations of 59 of these by L. A. Fuertes accompany the account, together with drawings of the tracks of 19 by Ernest Thompson Seton.

On the fauna of Great Salt Lake, A. WETMORE (*Amer. Nat.*, 51 (1917), No. 612, pp. 753-755).

Revision of the rodent genus *Aplodontia*, W. P. TAYLOR (*Univ. Cal. Pubs. Zool.*, 17 (1918), No. 16, pp. 435-504, pls. 5, figs. 16).—The rodents of this genus known as mountain beaver, of which thirteen forms are recognized, are herbivorous, colonial, nocturnal, and fossorial. Although locally they do some damage to man's interests, their habitat is such that for the most part they are of no economic significance. They burrow holes in ditch walls along the line of the Southern Pacific in the Sierra Nevada in California; in Oregon they undermine Government trails, causing them to be washed out; and in western Washington considerable complaint has been made of their depredations on crops, particularly small fruits. Their skins are of little or no value.

Spirochaeta icterohæmorrhagiæ in the common rat in England, A. C. COLES (*Lancet* [London], 1918, I, No. 13, pp. 468, 469, fig. 1).—An examination by the author of 100 rats collected in the vicinity of Bournemouth showed 9 per cent to harbor this spirochete.

The book of birds, edited by G. GROSVENOR (*Washington, D. C.: Nat. Geogr. Soc.*, 1918 pp. VIII+195, figs. 279).—The several articles here presented are as follows: Common Birds of Town and Country (pp. 1-73), substantially noted from another source (E. S. R., 31, p. 547), and Friends of Our Forests—the Warblers (pp. 74-97), by H. W. Henshaw; World Record for Feathered Friends, by G. Grosvenor (pp. 98, 99); How Birds Can Take Their Own Portraits, by G. Shiras, 3d (pp. 101-104); American Game Birds, by H. W. Henshaw, including a list and index of American game birds (pp. 105-159); Encouraging Birds Around the Home, by F. H. Kennard (pp. 160-179); and Our Greatest Travelers, by W. W. Cooke (pp. 180-195), substantially noted from another source (E. S. R., 33, p. 57).

The 250 illustrations in color are reproductions of paintings by L. A. Fuertes.

Catalogue of birds of the Americas, C. B. CORV (*Pubs. Field Mus. Nat. Hist.* [Chicago], *Zool. Ser.*, 13 (1918), pt. 2, pp. 315, pl. 1).—This is the second part, the first to be issued, of a work intended to include all the species and subspecies of birds known to occur in North America (from the Arctic Islands, Greenland, and Alaska, southward), Middle America (including Mexico and Central America), the West Indies and islands of the Caribbean Sea, South America, and adjacent islands of the Atlantic and Pacific Oceans having faunal relationship. It takes up the families Bubonidae, Tytonidae, Psittacidae, Steatornithidae, Alcedinidae, Todidae, Momotidae, Nyctibiidae, Caprimulgidae, Cypselidae, and Trochilidae.

In Audubon's Labrador, C. W. TOWNSEND (*Boston: Houghton Mifflin Co.*, 1918, pp. XII+354, pls. 34).—This work, based upon observations made during

several trips to eastern Labrador, contains much information relative to the economic ornithology of Labrador.

Attracting birds to public and semipublic reservations, W. L. McATEE (*U. S. Dept. Agr. Bul. 715 (1918), pp. 12, figs. 4*).—This summary of information was prepared for general distribution among organizations and individuals interested in the protection of wild birds and is of particular value to those in charge of parks, cemeteries, and other public and semipublic reservations. It is one of the series previously noted (*E. S. R.*, 38, p. 556).

On the value of the different methods of estimating the stomach contents of wild birds, W. E. COLLINGE (*Scot. Nat., No. 77 (1918), pp. 103-108, figs. 2*).—The chief advantages found in the percentage by bulk or volumetric method of estimating the amount of food in the stomachs of birds are pointed out.

A monostome of the genus *Collyriclum* occurring in the European sparrow, with observations on the development of the ovum, E. E. TYZZER (*Jour. Med. Research, 38 (1918), No. 2, pp. 267-292, pls. 5*).—A report of studies of a trematode found in dermal cysts occurring in young sparrows (*Passer domesticus*) killed in the vicinity of Boston, Mass., which corresponds closely to the European species *C. faba*.

Entomology, A. W. MORRILL (*Arizona Sta. Rpt. 1916, pp. 294, 295*).—In control work with the clover seed chalcid fly due to unfavorable conditions no definite results were obtained. In further work with the harvester ant (*E. S. R.*, 35, p. 551) a total of 74 nests were found and treated, including many weak colonies, by the method previously described, an average of only 1.3 oz. of London purple being needed during the season for each nest.

During an outbreak of one of the false chinch bugs (*Nysius minutus*), closely related to the common false chinch bug (*N. ericae*), which took place in the Salt River Valley in the spring of 1916, a number of crops of which Irish potatoes and flax are the most important were more or less seriously injured. Experimental control work, which was limited to small plats of flax, led to the invention of a special galvanized-iron collector devised to be used with a film of kerosene on water in the collecting pan as in ordinary hopperdozers, which proved satisfactory. A similar device on wheels which can be pushed at walking pace along the rows has been constructed for use on large acreages of flax in southern Arizona, where flaxseed is a most promising crop. The principal source of the bugs seems to have been the common pig weed (*Chenopodium album*), on which they may be destroyed by means of blast torches of strong sprays of kerosene emulsion. On vegetable crops nicotine sulphate-whale-oil soap solution was recommended.

Seventeenth report of the State entomologist of Connecticut for the year 1917, W. E. BRITTON (*Connecticut State Sta. Bul. 203 (1918), pp. 231-370, pls. 32, figs. 4*).—Following reports upon the inspection of nurseries and of apiaries suppression work against the gipsy and brown-tail moths is discussed by W. E. Britton and I. W. Davis (pp. 246-258). W. E. Britton and M. P. Zappe report briefly upon experiments carried on in two apple orchards in spraying to control aphids (*Aphis sorbi* and *A. pomi*) and the false red bug (*Lygidea mendax*) (pp. 259-262), the results of which are summarized in tabular form. A summarized account of the striped cucumber beetle and means for its control by Q. S. Lowry (pp. 262-273) includes a bibliography. A review of the status of knowledge on the imported pine sawfly (*Diprion [Lophyrus] simile*), including a bibliography of 42 titles, is given by W. E. Britton and M. P. Zappe (pp. 273-290). This dangerous European sawfly, which was introduced into this country on nursery stock and first discovered in Connecticut in 1914 (*E. S. R.*, 35, p. 760), has since been found in New Jersey and New York and has apparently become established in the three States independently. Eight

species of hymenopterous parasites and one dipterous parasite have been reared from it. Three of the former, *Dibrachys nigrocyaneus*, *Monodontomerus dentipes*, and *Dibrachoides verditer*, bid fair to become effective in checking the pest. A bibliography of 41 titles is included.

In a paper on the outbreak of the pink and green potato aphid (*Macrosiphum solanifolii*), W. E. Britton and Q. S. Lowry (pp. 290-302) give a summarized account of this plant louse, an unprecedented outbreak of which occurred throughout the State, and a bibliography of 19 titles. Accounts of this pest in Maine by Patch (E. S. R., 25, p. 759), in Massachusetts by Regan (E. S. R., 38, p. 654), and in Ohio by Houser (E. S. R., 38, p. 462) have been noted.

A cockroach pest of greenhouses (*Pycnoscelus* [*Leucophaea*] *surinamensis*), first observed in greenhouses at Cromwell in 1911 and which became so numerous as to cause considerable damage in 1917 by gnawing the bark from the stems of plants, is reported upon by M. P. Zappe (pp. 302-313), and a brief description is given of poison baits which are thought to hold the pest in check. A list is given of 13 references to the literature.

The eradication of the little house ant or Pharaoh's ant from a dwelling house is reported upon by M. P. Zappe (pp. 314, 315). A summary of information is given on the oriental peach moth (*Laspeyresia molesta*) which has become established at Stamford and Norwalk (pp. 315-319). A summarized account of the fall webworm is given (pp. 319-324), with a bibliography of 8 titles. Other insects briefly considered are the hickory tussock moth (*Halisidota caryæ*) and other closely allied species (*H. tessellaria* and *H. maculata*), the walnut caterpillar (*Datana integerrima*) yellow-necked caterpillar (*D. ministra*), and red-humped apple caterpillar (pp. 325-330). A report on some insects injurious to stored food products in Connecticut (pp. 330-344), previously noted as Bulletin 195 (E. S. R., 37, p. 848), is followed by an account of mosquito control work in Connecticut during 1917 by B. H. Walden (pp. 345-356). Under the heading of miscellaneous insect notes some 20 minor insects are reported upon.

Report of the department of entomology, T. J. HEADLEE (*New Jersey Stat. Rpt. 1916*, pp. 467-519, pls. 4, figs. 3).—A list of the insects dealt with in the course of correspondence during the year, including scientific and common names, localities, and date, is first presented. Eight species excessively abundant or new to the State are briefly noted under the heading of Insects of the Year (pp. 475-477). The species of insects recently recorded as present in the State are listed by orders (pp. 477-486). A brief report on investigations of the influence of atmospheric moisture on insect metabolism (pp. 486-490), of which a more detailed account has previously been noted (E. S. R., 37, p. 254), and of the strawberry weevil (pp. 490-494) also previously noted (E. S. R., 37 p. 466) are included.

Experimental work with the rosy aphid (*Aphis sorbi*) (pp. 494-501) indicates that it can best be destroyed by making a dormant treatment with lime-sulphur or scalecide and following that with a green bud treatment of blackleaf 40 (1:1,000) plus soap (2 lbs. to 50 gals.), or by delaying the dormant treatment of lime-sulphur until the buds begin to show green and then applying it mixed with blackleaf 40 (1:500). It is pointed out, however, that the results obtained differ from those reported from the New York State Station (E. S. R., 37, p. 561), and furthermore treatment with winter strength lime-sulphur plus blackleaf 40 (1:1,000) gave an entirely satisfactory control. It is thought that the factor which causes this disagreement is in all probability the natural control effected by the weather or natural enemies or both.

The false cabbage aphid (*Aphis pseudobrassicæ*), which was taken in New Jersey for the first time, is thought to have been present for a considerable period. An apparatus for lifting the foliage in such a manner as to expose the underside of the turnip leaves to the mist delivered by the low-hung nozzles of a potato machine, which has been constructed and can be attached to a traction sprayer, is illustrated. In control work with the pear psylla satisfactory results were obtained from the procedure which includes the scraping off and burning of the rough bark during the fall and winter, followed in late fall or early winter by the application of winter strength soluble oil or 40 per cent nicotine (1:800) plus soap (1 oz. to the gallon), and with lime-sulphur (1:9) just before the blossom buds open.

Experiments were made in wintering bees in which colonies were left (1) totally without packing, (2) protected with a C. H. Root cover, and (3) packed in quadruple covers. The results show that the insulation paid well and that the C. H. Root cover gave the best results.

Miscellaneous notes (pp. 507-511) are given on a number of insects of the year, including the distribution of the periodical cicada in the State and a list prepared by H. B. Weiss of the Coccidæ of New Jersey greenhouses. A paper on the response of the house fly to certain foods and their fermentation products (pp. 511-519) by C. H. Richardson has been previously noted (*E. S. R.*, 37, p. 159).

Insect pests, J. C. HUTSON (*West Indian Bul.*, 16 (1918), No. 4, pp. 312-322).—A brief summary of the occurrence of some of the more important insects of the year in the British West Indies.

Injurious corn insects, H. C. SEVERIN (*South Dakota Sta. Bul.* 178 (1918), pp. 780-813, figs. 16).—Brief accounts are given of the more important insect enemies of corn in South Dakota and means for their control.

Results of experiments with miscellaneous substances against bedbugs, cockroaches, clothes moths, and carpet beetles, E. W. SCOTT, W. S. ABBOTT, and J. E. DUDLEY, JR. (*U. S. Dept. Agr. Bul.* 707 (1918), pp. 36).—This is a report of tests of numerous insecticides made at the Insecticide Board's Testing Laboratory in connection with the enforcement of the Insecticide Act.

In a test made on the bedbug many of the substances used were found to be effective. In tests on cockroaches sodium fluorid was found to be the most rapid killer of all the substances tested, only 24 hours being required to kill 100 per cent in cage tests, even when the material was diluted down to 18 per cent. Practically 100 per cent were killed in treated kitchens by the use of a mixture containing 50 per cent of sodium fluorid. In experiments with clothes moths naphthalin killed all stages; a red cedar chest killed all adult moths and was very effective upon young larvæ; pyrethrum powder readily killed the larvæ; etc. With carpet beetles naphthalin killed all stages; camphor was effective, but less readily so; and ethyl alcohol (50-85 per cent solutions), powdered cloves, gasoline, mercuric chlorid, and fumigation with sulphur (8.5 oz. to 360 cu. ft.) killed the larvæ effectively.

Spraying formulas for orchard insects, A. L. MELANDER (*Wash. State Col. Ext. Dept.*, Ser. 1, No. 39 (1918), pp. 16, figs. 11).—The insecticide formulas more commonly recommended for the control of orchard insects are here brought together. An orchard spraying calendar for the more usual applications and specific treatments for the more usual orchard pests are given.

Poisoning tree parasites with cyanid of potassium, M. M. METCALF (*Science*, n. ser., 47 (1918), No. 1214, pp. 344, 345).—Tests by the author indicate that inoculation of apple and pear trees with cyanid of potassium, when used without admixture of other drugs, is not necessarily injurious to the trees. Whether it

destroys infesting scales appears to be doubtful. See also previous notes (E. S. R., 33, pp. 154, 556, 725; 35, p. 755).

Nicotin-paraffin emulsion, A. H. LEES (*Jour. Bd. Agr. [London]*, 24 (1918), No. 12, pp. 1411-1415).—A discussion of the use of this compound insecticide.

The Zygoptera, or damsel flies, of Illinois, P. GARMAN (*Bul. Ill. State Lab. Nat. Hist.*, 12 (1917), Art. 4, pp. 411-588, pls. 16).—This report of a taxonomic study of the damsel flies of Illinois includes a bibliography of six pages.

Grasshopper control in Montana, R. A. COOLEY, J. R. PARKER, and H. L. SEAMANS (*Montana Sta. Circ.* 76 (1918), pp. 119-147, figs. 16).—This is a summary of information on the various means for the control of grasshopper outbreaks. It is stated that in 1917 an outbreak occurred in western Montana which in severity approached those of pioneer days.

The European mole cricket, *Gryllotalpa gryllotalpa*, an introduced insect pest, H. B. WEISS and E. L. DICKERSON (*Jour. N. Y. Ent. Soc.*, 26 (1918), No. 1, pp. 18-23, pl. 1).—A brief account is given of the life history and habits of this European pest, which has recently become established at Rutherford, N. J. (E. S. R., 34, p. 653).

Synoptic key to the subfamilies of Miridæ (Hemiptera-Heteroptera), H. H. KNIGHT (*Jour. N. Y. Ent. Soc.*, 26 (1918), No. 1, pp. 40-44, pl. 1).—A key is given for the separation of twelve subfamilies of Miridæ.

Nezara viridula and kernel spot of pecan, W. F. TURNER (*Science, n. ser.*, 47 (1918), No. 1220, pp. 490, 491).—Preliminary experiments in Georgia, in which specimens of *N. viridula* taken on cowpeas grown in pecan orchards were confined and lived on pecan nuts for as long as a month indicate that this bug may transmit the causative fungus of kernel spot, recently described by Rand (E. S. R., 30, p. 452) as *Coniothyrium caryogenum*.

This disease is of general occurrence throughout the pecan belt and occasionally causes considerable loss, as was the case in southern Georgia in 1916.

The bedbug, its habits and life history and how to deal with it, B. F. CUMMINGS (*Brit. Museum (Nat. Hist.)*, *Econ. Ser.* No. 5 (1917), pp. 20, figs. 7).—A popular summary of information.

Corythucha spinulosa, a new lace-bug on wild cherry, E. L. DICKERSON and H. B. WEISS (*Ent. News*, 29 (1918), No. 4, pp. 121-125, pl. 1).—This paper relates to a new lace-bug (*C. spinulosa*) found feeding on *Prunus serotina* at Jamesburg, N. J., during the late summer of 1916. A paper containing the description of this insect by Gibson has been previously noted (E. S. R., 39, p. 657).

The control of the apple capsid bug by spraying, F. R. PETHERBRIDGE (*Jour. Bd. Agr. [London]*, 24 (1918), No. 12, pp. 1401-1410, pls. 2).—The author's experiments, here reported, show soft soap and nicotin spray to be very effective in a favorable season in preventing damage to apples by capsids, *Plesiocoris rugicollis*. The amount of soft soap necessary to make the wash effective varies with the hardness of the water; with soft water 10 lbs. to 100 gal. or even less is sufficient, with hard water a greater amount is needed. The amount of nicotin in the wash should be from 7 to 8 oz. per 100 gal.

Obtaining beet leaf hoppers nonvirulent as to curly top, C. F. STAHL and E. CARSNER (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 9, pp. 393, 394).—This is a report of work by the Bureau of Entomology of the U. S. Department of Agriculture in which reference is first made to the observations of Smith and Bonquet and Bonquet and Hartung, previously noted (E. S. R., 34, pp. 645, 646).

The authors find that nonvirulent leaf hoppers can be obtained with certainty and relative ease by lifting the nymphs off the plant before they have had an opportunity to feed and transferring them to healthy plants. In the first experiment three lots of nymphs were transferred as they hatched out to three

healthy beet plants in separate cages, where they remained until they became adults without causing the disease. Insects of two of these lots which were caged on two separate plants affected with curly top and after 17 days transferred to two healthy plants transmitted the disease to both plants. Other experiments, in one of which as many as 200 leaf hoppers were used, gave similar results and show conclusively that uninfected insects placed on healthy plants will not produce curly top. It is pointed out that the disease of the common mallow (*Malva parviflora*) has been shown by Bonquet and Stahl (E. S. R., 37, p. 847) to be caused by the same virus which causes the beet disease.

The biology of *Phthirus pubis*, G. H. F. NUTTALL (*Parasitology*, 10 (1918), No. 3, pp. 383-405, figs. 9).—A detailed report of studies of the crab louse.

A female raised experimentally laid up to 3 eggs per day, with a total of 26 eggs. From 6 to 8 days were found to be required for the incubation of the egg. Like *Pediculus humanus* it passes through three molts before becoming adult. Its life cycle is completed in from 22 to 27 days. The young unfed larvae usually die within 10 hours of emergence. When removed from man, they survive longer at 16 to 20° C. than at 30° (86° F.) and die much more rapidly in a dry than in a moist atmosphere; none of the numerous lice of all stages that were tested were found to survive up to 42.5 hours, when maintained under different conditions. A male survived on a man for 22 days and a female for 17 days, but they can probably live longer.

[Gipsy and brown-tail moth work in Massachusetts], L. O. HOWARD (*Ann. Rpt. State Forester Mass.*, 14 (1917), pp. 45, 46).—This is a brief report submitted to the Massachusetts State forester upon the results of the work with the parasitic and predacious enemies of the gipsy and brown-tail moths in Massachusetts during 1917.

[The bollworm as an enemy of vetch], P. LUGINBILL (*Ann. Rpt. Comr. Agr. Com. and Indus.*, S. C., 14 (1917), pp. 142-149).—The bollworm has in recent years become an important enemy of vetch, due probably to the increased acreage devoted to this plant, and in many localities is known as the vetch worm.

Injury is caused by eating the leaflets of the plants but the greatest damage is done to the pods into which the worms bore and eat the seed. In case of a heavy infestation the damage is so great that the crop is practically worthless for seed. Where grown for a hay crop, however, the injury is on the whole not great as it is usually cut before the worms attain a sufficient size to do much harm. It is said to be mistaken at times for the fall army worm.

Remedies mentioned include the use of arsenicals, poisoned bran bait, and the cutting of a heavily infested crop after having plowed a deep furrow about the field to safeguard growing crops in surrounding fields.

The pink bollworm, with special reference to steps taken by the Department of Agriculture to prevent its establishment in the United States, W. D. HUNTER (*U. S. Dept. Agr. Bul.* 723 (1918), pp. 27, figs. 10).—This is a summary of information on the present status of knowledge of this pest, its distribution, nature and amount of damage which it causes, description and life history, natural enemies, and precautions taken to prevent introduction into the United States. The bulletin includes the information previously noted from another source (E. S. R., 39, p. 465) and a bibliography of 13 titles.

Memorandum concerning the control of the pink bollworm, W. D. HUNTER (*Memorandum Concerniente al Exterminio del Gusano Roedor del Algodon. Mexico: Dir. Agr.*, 1917, pp. 25, pls. 2).—A summary of information in both English and Spanish.

Experiments on the control of the vine moths, M. TOPI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), I, No. 4. pp. 258-261; abs. in

Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 9, pp. 1328, 1329).—A report of work with *Polychrosis botrana* and *Cochylis ambiguella* in Piedmont, Italy.

Stalk borers, T. L. GUYTON (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 244-246).—A brief summary of information on the more important stalk borers, including the stalk borer (*Papaipema nitela*), *Hadena* stalk borers (*Hadena* sp.), squash borer, lesser cornstalk borer (*Elasmopalpus lignosellus*), and sugar cane borer. The farm practices that aid in their destruction are pointed out.

Peach borer observations at Vineland, M. A. BLAKE and C. H. CONNORS (*New Jersey Stat. Rpt. 1916*, pp. 74-78, pl. 1, fig. 1).—This is a report of observations and of records kept in the experimental orchards at Vineland in continuation of those of previous years (*E. S. R.*, 36, p. 857).

The experiments with various repellents were continued, in which rows of trees received asphaltum, white lead, whitewash (Government formula), Sulfolide, concentrated lime-sulphur, Scott tree protectors, and a modification of Scott tree protectors made of two-ply tar paper. It is stated that none of these repellents applied to the trunks gave any measure of protection to the trees, with the exception of asphaltum. The results indicate that a thorough application of asphaltum to 6 to 8 in. of the trunk with a collar at the surface of the tree tends to reduce the number of borers. Thoroughness of application is vital since if the application be too thin the coating will open as the rough bark expands with growth and there is a tendency to break the coating at the lenticels. Preliminary tests were made of the application of a solution of sodium cyanid to the soil about the trees.

Nine-year band record of the codling moth, J. W. RIGNEY and A. B. FITE (*New Mexico Sta. Bul. 110* (1918), pp. 60, figs. 21).—In an introduction by F. Garcia it is pointed out that the data on the movement of the larvæ, here presented are based upon investigations during the last 9 years in New Mexico, where the codling moth is one of the worst pests with which the apple grower has to contend, particularly in the lower and warmer irrigated valleys, where the larger apple orchards are located. Late frosts in April, 1907, destroyed practically all the fruit in the Rio Grande Valley and an attempt was made during May and June to exterminate the codling moth by destroying all the apples remaining on the trees. All the wormy apples shipped into the valley in 1907, of which there were but few, were destroyed, with the result that during 1907 and 1908 no worms were found under the bands worked and none in 1909 until July 22. The attempt to eradicate the codling moth permanently did not prove to be successful, although the heavy crop during 1908 and about 90 per cent of that of 1909 was sound. The codling moth began to reinfest the orchards toward the last of the season of 1909 and toward the last of 1910 the infestation was about as bad as before the severe freeze of 1907.

The results of banding work are recorded, accompanied by tables and life curves.

"The effect of rain and temperature on the movement of the larvæ was not so very pronounced, although on the whole there were fewer larvæ caught immediately following a rain of any consequence or a decided drop in temperature. More larvæ per band were caught under the dark colored than under the light cloth. From the morning and evening observations it was found that about three times as many larvæ went under the bands at night as in the daytime. The double-band records show that 1.32 times as many larvæ crawl down the trees and under the upper bands as were caught under the lower bands. From the morning and evening observations for worms in windfallen apples it was found that 55.4 per cent of the windfalls were wormy and that 80.1 per cent

of the worms left the apples before they fell from the trees and were examined. It was estimated from the three years of weekly band records that \$157.70 worth of apples were saved at a total cost of \$17.26. In 1915 an average of 19.6 larvæ were caught per tree per week.

"The average daily life curve, made by combining the data for six of the daily life curves, indicated 4 broods of larvæ. Consequently, there were 4 generations of codling moths. The overlapping of broods indicates different lengths of life cycles for individuals.

"The first larvæ were caught on May 18, with a maximum emerging in July and August. The curves for the different years fluctuate considerably but they show the relative distribution of the codling moth during the season.

"These data show that it is difficult to control the codling moth. The maximum larvæ occur toward the middle of the season and there is a great overlapping of broods. Although the curves show that there are 4 broods of larvæ of the codling moth in this locality, many natural enemies were observed feeding on them."

Controlling the midge in Ohio wheat fields, H. A. GOSSARD (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 233-235, fig. 1).—A brief popular account of this pest, in which the manner in which good farm practices aid in its control is pointed out.

Report of the mosquito work for 1916, T. J. HEADLEE (*New Jersey Stat. Rpt. 1916*, pp. 521-557, figs. 8).—This report of the work of the year in control work with mosquitoes includes notes on mosquitoes of the year, larvicides, etc.

"The four contracts between the State and various contractors for salt marsh ditching, which were executed but not finished last year, have been satisfactorily completed this year, with a total of 745,105 linear feet of narrow ditching. The counties have cleaned thoroughly 500,000 linear feet of ditching, and removed obstructions throughout all the drainage systems to keep them in working order. The counties have cut 2,543,713 linear feet of new 10 by 30 in. ditching or its equivalent on the salt marsh. They have patrolled 95,000 acres of salt marsh (covering a coast line of 125 miles), have patrolled 315,000 acres of upland, and have afforded a good measure of protection to 1,750,000 people.

"The investigation of larvicides, which included a test of substances consisting of metal salts, drugs, and more or less pure organic chemicals, shows that while a number of compounds that would destroy mosquito larvæ were found, none had the ability to remain effective for more than a limited period after the application was made."

Mosquitoes and their relation to disease, their life history, habits, and control, F. W. EDWARDS (*Brit. Museum (Nat. Hist.)*, *Econ. Ser. No. 4* (1916), pp. 20, figs. 6).—A popular summary of information.

Cauleryella anophelis n. sp., a schizogregarine parasite of the larvæ of *Anopheles bifurcatus*, E. HESSE (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 14, pp. 569-572).—Under the name *C. anophelis* the author describes a new species parasitic in the intestines of 15 per cent of the larvæ of *A. bifurcatus* examined, taken in the immediate vicinity of Grenoble, France, in January. A closely related species has been previously described by Keilin (*E. S. R.*, 31, p. 851).

Larva of a dipterous fly feeding on *Helicella itala*, E. W. BOWELL (*Proc. Malaco. Soc. [London]*, 12 (1917), No. 6, p. 308; abs. in *Rev. Appl. Ent.*, Ser. A, 6 (1918), No. 1, p. 26).—*Sarcophaga nigriventris* has been found to destroy this mollusk in Surrey.

Data concerning flies that frequent privy vaults in Montana, R. R. PARKER (*Ent. News*, 29 (1918), No. 4, pp. 143-146).—This account includes tables giving

data concerning 25 species of flies captured in a privy trap experiment at Laurel, Mont., from July 20 to August 21, 1914.

Field notes on the distribution and life habits of the tiger beetles (Cicindelidae) of Indiana, W. M. GOLDSMITH (*Proc. Ind. Acad. Sci.*, 1916, pp. 447-455, fig. 1).—These notes relate to observations on the occurrence of and life history and habits of Cicindelidae, based upon collecting trips made in 21 counties. It is pointed out that since the Cicindelidae are entirely carnivorous, living upon insects which are as a whole injurious to growing vegetation, their economic value should receive greater recognition.

Experimental work on the control of the white grubs of Porto Rico, R. T. COTTON (*Jour. Dept. Agr. P. R.*, 2 (1918), No. 1, pp. 1-18).—The author reports experiments with insecticides and mechanical measures which have led to the conclusion that the collection of grubs and beetles, while far from being entirely satisfactory, is the only practical means of holding this pest in check. The white grubs were found to be alive and active after two weeks' submergence. It is thought that the introduction of predacious and parasitic enemies will be of considerable aid in the control of the pest.

Chilocorus bipustulatus, a coccinellid enemy of scales, J. COTTE (*Bul. Soc. Path. Vég. France*, 4 (1917), No. 2, pp. 86-88).—A brief account of observations of this ladybird beetle by the author at Nice, France, where it is an enemy of *Chrysomphalus dictyospermi minor* on citrus.

Flea-beetles as pests of the garden, J. R. STEAR (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 251-253).—A brief popular account with directions for their control.

Recent experimental work on poisoning cotton boll weevils, B. R. COAD (*U. S. Dept. Agr. Bul.* 731 (1918), pp. 15, figs. 10).—This is a progress report of work in poisoning the boll weevil which has been carried on by the author at Tallulah, La., near Lake Village, Ark., and near Scott, Miss. During the course of investigational work the author's observations under cage conditions that the weevils drink water very regularly and the conclusion that under field conditions they would secure this apparently essential moisture by drinking from the rain or dew collected in droplets on the leaves of the cotton plants led to attempts to poison the water which the weevils drink. The details relating to this work carried on in 1915, 1916, and 1917, here reported, show that much may be accomplished in this way. The author, however, does not as yet wish to advise the general use of poison for weevil control.

During the course of work in which a number of different arsenicals were applied as dust the newer dihydrogen form of lead arsenate proved to be vastly more toxic than the triplumbic form, but a high-grade of calcium arsenate was still more effective. It is pointed out that the latter contains a much higher percentage of arsenic pentoxid than any other arsenical used and has the advantage of being much cheaper than lead arsenate. It appears that either a dihydrogen lead arsenate containing not less than 32 per cent of arsenic pentoxid or a calcium arsenate containing at least 42 per cent of arsenic pentoxid will produce an effective control if utilized properly. These poisons when used at a density ranging from 80 to 160 cu. in. per pound proved much more effective than at a density of 40 cu. in. per pound. During the course of the work a machine for applying the poison was developed with which nearly 200 acres can be covered in a single day.

More effective poisoning usually can be done from about 4 p. m. until about 9 a. m. than at other times, although fairly successful results have been secured from applications made throughout the day. As a general rule experimental applications averaged about 5 lbs. per acre, but it appears that this amount is excessive, and with further improvement in the machinery it will be possible to accomplish an effective poisoning with a much smaller amount.

"The number of applications necessary undoubtedly will vary. This must depend entirely on the conditions prevailing within the particular cut under consideration. In most of the experiments conducted so far from three to five applications were made, but, as has been shown, the effectiveness of these was considerably reduced by the fact that they were on such small plats. In the only case in which experiments on a very large scale were conducted, the effect of a single application was as pronounced as is ordinarily secured from about three applications on a small plat, due, of course, to the constant migration of weevils into the small plat."

In the strictly experimental tests conducted so far the cost of treatment has averaged about \$1 per acre for each application. It is pointed out, however, that it will be possible to reduce this considerably when the applications are made on a larger scale and with improved machinery.

Beekeeping for Connecticut, A. W. YATES (*Connecticut State Sta. Bul.* 205 (1918), pp. 425-446, pls. 4, figs. 19).—A summary of information intended for those interested in beekeeping.

Bee disease, D. ELLIS (*Nature* [London], 101 (1918), No. 2528, pp. 103, 104).—The author reports having made a microscopic examination of contents of the intestines and chyle stomachs of several dozen bees suffering from Isle of Wight bee disease without discovering a trace of *Nosema apis*.

The Pearce new method of beekeeping, J. A. PEARCE (*Grand Rapids, Mich.: Author, 1918, 3. ed., rev., pp. 58, figs. 21*).—This work, which is based upon 40 years' experience in beekeeping, describes a method which includes the use of double-height hives placed in buildings for protection. In this way the bees are held together until the white honey is taken off about the first of August and loss from swarming eliminated.

A list of Indiana ants, W. M. WHEELER (*Proc. Ind. Acad. Sci., 1916, pp. 460-466*).—An annotated list of 46 forms.

Species of Arachnida and Myriopoda (scorpions, spiders, mites, ticks, and centipedes) injurious to man, S. HIRST (*Brit. Museum (Nat. Hist.), Econ. Ser. No. 6* (1917), pp. 60, pls. 3, figs. 26).—A popular summary of information.

The chicken tick (*Argas miniatus*), C. E. SANBORN and H. R. PAINTER (*Oklahoma Sta. Bul.* 118 (1918), pp. 3-8, figs. 7).—This summary of information, in which the fowl tick is recorded from southern Oklahoma, includes a report on the effects of temperatures on its life by R. A. Cooley (pp. 7, 8) at the Montana Station. It is concluded that the species can withstand extreme cold weather but does not thrive under such conditions.

FOODS—HUMAN NUTRITION.

The conservation of food energy, H. P. ARMSBY (*Philadelphia and London: W. B. Saunders Co., 1918, pp. 65*).—In this book a brief comparison is given of the efficiency of the various methods by which some of the more important farm products may be made to contribute to the food supply. The comparisons are based solely upon the proportion of the total energy of the products which can be recovered for man's use. Among the points emphasized are the great loss of energy involved in the feeding of live stock and the wastefulness of diversion to stock feeding of any material edible by man; the high percentage recovery of energy in pigs and dairy cows as compared with beef cattle and sheep; and the importance of utilization in animal feeding of by-products of manufacturing inedible by man.

Foods and their relative nourishing value (with 24 recipes for the use of maize), W. H. THOMPSON (*Dublin [Ireland]: Ponsonby and Gibbs, 1917, 2. ed.,*

rev., pp. 38, figs. 10).—A revision of this brief treatise on foods, in which the appendix gives recipes for the use of maize.

Use of corn (maize) as human food, H. C. SHERMAN (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 22, pp. 1579-1581).—A series of dietary studies on healthy subjects is described in which special attention was paid to the digestibility and nutritive value of corn proteins. In one of the studies more than 10 oz. of corn meal was eaten daily, the remainder of the diet consisting of limited amounts of milk, fruit, sugar, and fat. The corn meal furnished about one-half of the calories and three-quarters of the protein of the diet and replaced the whole amount of breadstuffs and cereals usually eaten.

The corn meal diet was taken continuously for a month with no disturbance whatever of appetite or digestion. Nitrogen equilibrium was maintained throughout the experiment on an intake of only 36 gm. of protein per day, showing that the maize protein was highly efficient. The corn meal used was baked in the form of thin scones and was considered to be more easily digested in this form than when simply boiled with water to a mush.

The author concludes that "it is evident that corn meal, suitably cooked, can be substituted for corresponding wheat products even to an extent equivalent to the whole of the usual consumption of wheat in the dietaries of those who live largely on bread without detriment to the nutritive value of the diet."

A tabulation of menus for 21 meals in which 50.5 per cent of the calories is contributed by corn products is given to show the possibilities of the utilization of corn products without detriment to the palatability or attractiveness of the diet.

War bread, A. E. TAYLOR (*New York: The Macmillan Co.*, 1918, pp. 99).—A brief discussion of the conservation of wheat under war conditions. Briefly stated, the author's conclusions are that the direct substitution of other cereals for wheat and the judicious use of mixed flours are the best ways of conserving it. Long extraction flours so milled as to include the germ or bran have not proved satisfactory for the making of war bread.

How to use soy beans for human food, T. A. KIESSELBACH (*Nebraska Sta. Bul.* 166 (1918), pp. 13-16).—Recipes for the use of soy bean flour and whole soy beans boiled are given, together with analyses of soy bean flour and soy bean milk.

[Ash content of Arizona sorghum sirup], A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt.* 1916, p. 301).—In view of the contention that sorghum grown in arid regions produces sirup of poor quality due to excessive mineral salts, an analysis of a sample of sorghum sirup of apparently good quality prepared from cane grown near Yuma is reported. This sample contained a relatively low content of mineral matter.

Sugar substitutes in bottled soft drinks.—I, Ginger ale, W. W. SKINNER and J. W. SALE (*Nat. Bottlers' Gaz.*, 37 (1918), No. 435, pp. 74, 75).—Experiments conducted by the Bureau of Chemistry, U. S. Department of Agriculture, are reported, in which sweet cereal products have been substituted in whole or in part for ordinary sucrose in making ginger ale.

Wholesome war-time desserts, GERALDINE HADLEY (*Purdue Univ., Dept. Agr. Ext. Bul.* 70 (1918), pp. 8).—Recipes are given for simple, nutritious, and easily prepared puddings and desserts, in which sugar substitutes are used and other war-time economies recommended.

The woman's committee survey of agencies for the sale of cooked food, HELEN W. ATWATER (*Jour. Home Econ.*, 10 (1918), No. 9, pp. 419-424).—This article reviews the history and development of public or cooperative cooking abroad. It outlines a plan to be conducted by the Department of Food Pro-

duction and Home Economics of the Woman's Committee of the Council of National Defense for the survey of agencies in the United States for the sale of cooked foods to be consumed away from the place of sale. It is hoped that this survey would prove of practical use in case cooperative feeding should be necessary.

Suitable storage conditions for certain perishable food products: Apples, potatoes, sweet potatoes, onions, cabbage, eggs, frozen eggs, poultry, butter, and fish (*U. S. Dept. Agr. Bul. 729 (1918), pp. 10, pl. 1*).—Information is given here concerning the proper storage conditions, length of storage, and percentage of shrinkage in storage for these products.

Food Surveys (*U. S. Dept. Agr., Food Surveys, 2 (1918), Nos. 2, pp. 8; 3, pp. 20, figs. 23; 4, pp. 12, figs. 15*).—These numbers deal, respectively, with commercial stocks of grain, flour, and miscellaneous food products in the United States on August 1, 1918; dairy and related products, not including retail stocks; and wheat, flour, and other wheat food products, not including retail stocks.

Fat-soluble vitamin, I, H. STEENBOCK, P. W. BOUTWELL, and HAZEL E. KENT (*Jour. Biol. Chem., 35 (1918), No. 3, pp. 517-526, figs. 16; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 16, p. 1343*).—The authors discuss the stability of the fat-soluble vitamin and the factors involved in variations in the amount of vitamin present in different samples of butter fat.

Experimental evidence is offered to show that heat, in the absence of water or of conditions designed to bring about intimate contact with air, is responsible for the destruction of the vitamin. It is suggested that the failure of other investigators to note this destructive action was undoubtedly due to the high initial content of fat-soluble vitamin in the material studied and to the evident low velocity of the destructive process. Other factors suggested as responsible for variation in the vitamin content of butter fat are the influence of the feed on which the butter fat has been produced, storage conditions, and the methods of using the product in the home.

The authors conclude that with an abundance of the vegetative part of plants in the diet the superior value of butter fat over other fats in the human diet is questionable, but that "in the absence of such materials in the diet the superior value of butter fat and, in fact, its necessity therein for normal nutrition is not to be denied. Then it becomes an important matter to know how this superior quality of butter fat can be obtained and preserved."

The choice between adequate and inadequate diets, as made by rats, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem., 35 (1918), No. 1, pp. 19-27, figs. 5; abs. in Chem. Abs., 12 (1918), No. 19, p. 2000*).—The authors report the results of a "free choice" system of feeding rats which seem to demonstrate a somewhat surprising ability of rats to make selections between two food mixtures of somewhat similar physical character, one of which is less adequate than the other for nutrition during growth. Although the rats usually ate some of each kind of food offered, as a rule they ate more of the adequate food than of the inferior one.

The authors conclude that it seems to be more than a coincidence that the choices which the rats made correspond so well with what experience has demonstrated to be preferable from the standpoint of growth. It is considered that this choice gives evidence that the desire of the young animal for food is something more than the mere satisfaction of its caloric needs.

Experimental scurvy of the guinea pig in relation to the diet, B. COHEN and L. B. MENDEL (*Jour. Biol. Chem., 35 (1918), No. 3, pp. 425-453; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 16, p. 1343*).—The present study was undertaken to ascertain whether experimental scurvy is demonstrable at will in the guinea pig, and to investigate some of the dietary aspects of the problem in

the light of recently developed theories. Studies are included of the rôle of inanition in experimental scurvy, scurvy-producing diets, milk in the production of scurvy, relation of roughage to the production of scurvy, and antiscorbutic diets. The report is prefaced by an historical review of the subject, and frequent references are made throughout to the results of other investigators. The results of the study reported are summarized as follows:

"Experimental scurvy of the guinea pig is demonstrable at will with suitably chosen diets. Exclusive diets of cereal grains, like oats and barley, produce the disease. Germinated oats or barley prevent the appearance of scurvy, even when fed for comparatively long periods. Scurvy arises on a diet of soy bean flour, even when the latter is supplemented with fat-soluble and water-soluble vitamins, inorganic salts, and cellulose. Small additions of raw milk do not prevent the onset of scurvy. Large quantities cause the symptoms to disappear. Roughage in the diet plays, if anything, a minor accessory rôle in the prevention of scurvy. This disease is not essentially dependent upon constipation as a causative factor; though the latter may aggravate the symptoms. Cabbage seems to retain some antiscorbutic properties even when dried. Contrary to certain current statements, highly purified lactose, fed in conjunction with a scurvy-producing diet, does not appear to have any effect upon the course of the disease."

The scurvy of guinea pigs, A. F. HESS and L. J. UNGER (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 479-496, pl. 1, figs. 14).—Two papers are presented.

I. *The experimental dietary*.—It is pointed out that the confused state in which the subject of scurvy stands at present is due largely to the fact that various investigators have not used the same diet and that they have not controlled their studies by means of pathological examinations. In this paper the results are reported of a large number of experiments in which guinea pigs were fed a basal diet of hay, oats, and water to which various other foodstuffs were added to determine their specific effect. The results are recorded in a series of charts, on which not only the usual weight curves are plotted but also curves representing as nearly as possible the clinical course of scurvy.

The charts show that a diet of hay, oats, and water ad libitum results in the development of scurvy. The daily addition to such a diet of 1.5 cc. of orange juice was sufficient to bring about a discontinuance of scorbutic symptoms and a gain in weight. The addition of hard boiled egg, cod liver oil, or liquid petrolatum to the hay-oats-water diet did not delay the onset of the disease.

The authors consider that a diet of hay, oats, water, and cod liver oil constitutes an excellent standard dietary for experimental scurvy as it comprises the various necessary food elements, is laxative in character, is antirachitic, and is in no degree antiscorbutic.

II. *Experiments on the effect of the addition of fruits and vegetables to the dietary*.—This is a study of the effect of augmenting the hay-oats-water dietary described above with fruits and vegetables and of the alteration in the antiscorbutic power of these foodstuffs caused by heating, drying, and aging. The question of the exact food value of dried fruits and vegetables was considered by the authors important from a nutritional point of view, and "of special significance at this time when dehydrated foods are being employed to an increasingly large extent both among the civil population and in Army rations." The experimental results are summarized as follows:

"Orange juice which had been allowed to age for some months in the refrigerator was found to have lost some of its antiscorbutic power. This factor may be extracted from orange juice by means of 95 per cent alcohol and is entirely absent in the residue. 'Artificial orange juice' prepared according

to the formula of McCollum and Pitz failed to protect guinea pigs from or to cure them of scurvy. It was also found to lack antiscorbutic power in infantile scurvy.

"Orange peel possesses marked antiscorbutic potency, and withstands desiccation remarkably well, retaining considerable of this power after being dried for three months. Prunes possess practically no value as a preventive against scurvy.

"Dehydrated vegetables were found to contain little or no antiscorbutic virtue. This experience coincides with that encountered in relation to human scurvy. As this food is of decided nutritive value, efforts should be instituted to improve the methods of dehydrating and of storing so as to obviate this deficiency."

Prophylactic therapy for rickets in a negro community, A. F. HESS and L. J. UNGER (*Jour. Amer. Med. Assoc.*, 69 (1918), No. 19, pp. 1583-1586).—The authors report the successful use of cod liver oil as a prophylactic treatment for rickets in a negro community in New York City.

Infants who received the oil for six months regularly were protected from rickets, while those who were given no protective therapy were almost certain to develop the disease. The oil proved to be a more potent factor than breast feeding in preventing the disease.

The undernourished child, L. E. HOLT (*Gen. Fed. (Women's Clubs) Mag.*, 17 (1918), No. 8, pp. 15, 16).—An appeal, with suggestions, for greater attention to the proper nourishment of children in the factories and in the schools.

Dietary for children from two to six years of age, MARY L. FURST and SARAH S. VANDERBILT (*Nat. Fed. Day Nurseries, Leaflet 8* (1918), pp. 36).—This paper describes in simple terms a dietary containing the foods essential to the health and development of children of the preschool age. It discusses the food requirement of children from two to six years of age, and gives menus covering a period of two weeks suitable for use in day nurseries. Recipes are also included.

Child care.—I, The preschool age, Mrs. MAX WEST (*U. S. Dept. Labor, Children's Bur. Pub. 30* (1918), pp. 88).—A part of this publication deals with the proper food for children and the importance of good food habits for them. The material on a well-chosen diet, it is stated, is taken substantially from Farmers' Bulletins 717 and 808 (*E. S. R.*, 35, p. 62; 37, p. 364).

Animal calorimetry.—XIII, The interrelation between diet and body condition and the energy production during mechanical work, R. J. ANDERSON and G. LUSK (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 421-445).—This is a continuation of investigations previously noted (*E. S. R.*, 33, p. 869), and has been essentially noted from another source (*E. S. R.*, 37, p. 469).

Animal calorimetry.—XIV, The influence of mechanical work upon protein metabolism during the height of meat digestion in the dog, H. V. ATKINSON (*Jour. Biol. Chem.*, 33 (1918), No. 3, pp. 379, 380; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1999).—Continuing investigations noted above, it was found that "mechanical work has no influence on the hourly rate of absorption of protein or on the intensity of the hourly metabolism of protein in a dog which has been given meat in large quantity."

ANIMAL PRODUCTION.

Soapweed or palmilla (*Yucca elata*) as emergency forage, J. J. THORNER (*Arizona Sta. Timely Hints for Farmers*, No. 135 (1918), pp. 7, fig. 1).—In parts of southern Arizona stockmen are successfully feeding cattle the chopped stems of the plant known as soapweed, yucca, or palmilla as an emergency forage, although because of the expense of preparation it will not be utilized during

periods of good feed. Botanical notes on yucca are outlined, and the plant is compared with native cactus forage as an emergency feed. Results are given of chemical and microscopic analyses of chopped yucca forage.

Commercial feeding stuffs, E. M. BAILEY ET AL. (*Connecticut Sta. Bul.* 206 (1918), pp. 449-510).—Brief notes on the results of feed inspection work of the year are followed by tabulated results of analyses of cottonseed meal, cottonseed feed, linseed meal, wheat bran, wheat middlings, rye middlings, corn gluten feed, hominy feed, corn oil meal, brewers' grains, distillers' grains, dried beet pulp, cacao shell meal, corn meal, meat scrap, peanut skins and meal, cracker waste, damaged wheat, corn, and oats, waste flour, beans, condensed buttermilk, corn and bean silage, and mixed and proprietary dairy, stock, and poultry feeds.

Commercial feeds registered for sale in Indiana, May 1, 1918, E. G. PROULX ET AL. (*Indiana Sta. Bul.* 216 (1918), pp. 3-162).—This list of the brands of commercial feeds certified by manufacturers as being on sale in Indiana, May 1, 1918, shows the guaranties as to analysis of the feeds and the ingredients of which they are composed.

The farmers' beef club, P. F. TROWBRIDGE (*Missouri Sta. Circ.* 85 (1918), pp. 32, figs. 37).—This circular explains the operation of the farmers' beef club, and gives detailed directions for the slaughtering and curing of beef under farm conditions and cutting and dividing the carcass.

The sheep, J. W. WILSON and B. L. THOMPSON (*South Dakota Sta. Bul.* 177 (1918), pp. 764-778, figs. 3).—This bulletin reviews some of the results of experiments with sheep reported in earlier publications and presents in popular form information on the case of sheep for the production of mutton and wool, including notes on the handling of fleeces. Tapeworms in sheep are briefly discussed with regard to symptoms, treatment, and precautions.

One-night camps v. established bed grounds on Nevada sheep ranges, C. E. FLEMING (*Nevada Sta. Bul.* 94 (1918), pp. 21, figs. 9).—This bulletin describes the general method of handling sheep in summer on Nevada ranges, points out the advantages that would be gained by certain changes in the practices followed, and reports the results of experiments conducted to determine the practicability of handling sheep on the range in summer without returning each night to an established camp, and the effects of such a system on the sheep and the range as compared with the prevailing method of using permanent bed grounds until all the forage within a radius of from 1 to 3 miles is consumed.

During the summers of 1916 and 1917 three flocks each were studied under the one-night camp system and the established camp or bed ground system. A large uniform piece of range was selected so that differences in carrying capacity could be attributed only to the methods of handling the sheep. The total number of ewes and lambs in the six flocks under observation for the two summers ranged from 2,067 to 2,638 per flock, and the areas grazed from 1,776 acres to 5,578 acres per flock.

The tables presenting the detailed results show that the sheep under the one-night camp system utilized only 1.82 acres per head per 100 days of grazing as compared with 2.33 acres under the established camp system, or an increase of 21.4 per cent in carrying capacity. This advantage is considered due mainly to the reduction to a minimum of the loss of forage through trampling, the possibility of regrazing areas at later dates, the reduced trampling of the forage due to the more open feeding of the flocks, the small waste of forage owing to the fact that sheep trail less when choice feed is available, the reduced packing of the soil with the consequent greater retention of soil moisture and better plant growth, and the more uniform utilization of the areas grazed.

For the purpose of determining the degree of range utilization under the two systems a series of areas 6 ft. square were selected on two different ranges

before the grazing began and the total number of plants on each quadrat was ascertained. At the close of the grazing season the number of plants was recorded again and the degree of utilization noted. On the range with the grazed bed-grounds the quadrats were laid out from a central camp so that each one was placed in a different zone. At the close of the season it was found that the percentage of the plants removed in the various zones were as follows: $\frac{1}{4}$ -mile zone, 97 per cent; $\frac{1}{2}$ -mile zone, 95; $\frac{3}{4}$ -mile, 93; 1-mile, 68; $1\frac{1}{4}$ -mile, 48.4; $1\frac{1}{2}$ -mile, 20.5; $1\frac{3}{4}$ -mile, 14.1; and in the 2-mile zone no appreciable utilization. On the other range, under the bedding-out system, out of 32 quadrats an average of 84.4 per cent of the plants had been removed leaving an average of 15.6 per cent of the forage unconsumed. On this range all areas were partly grazed at first and then regrazed later.

The comparative gains made by lambs under each system were determined by weighing 20 average individuals from each flock at the beginning and at the close of the grazing season. Under the bedding-out system the lambs grazing an average of 58.5 days made an average daily gain of 0.37 lb. per head, and under the established bed-ground method the lambs grazing an average of 63.8 days made a corresponding gain of 0.316 lb., representing a difference of over 5 lbs. in the weight of a lamb for a grazing season of 100 days.

Observations were also made on the effect of the type of range on the milk production of ewes. Two ewes of Rambouillet breeding when grazed on a range with coarse and more or less dry grasses produced an average of 1.6 lbs. of milk per day. When then placed on a range with succulent forage their milk production immediately advanced to 2.1 lbs. per day.

The effect of trailing on growth was observed on 3 lambs forced to trail from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles to get to fresh feed. It was found that during an observation period of four days these lambs made each an average increase in weight of 0.25 lb. per day and that for four days after they were put on fresh green feed and the long trails eliminated they made an average daily gain of 0.32 lb. This would represent a difference of 7 lbs. in the weight of a lamb for a grazing season of 100 days.

Influence of humidity upon the strength and the elasticity of wool fiber, J. I. HARDY (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 8, pp. 285-296, pl. 1, figs. 2).—In these studies at the Wyoming Experiment Station of the influence of humidity on wool fiber the temperature was kept at 70° F. and the relative humidity was held at 40, 50, 60, 70, and 80 per cent. The results secured with regard to the breaking strength, tensile strength, diameter, and elasticity of wool fibers at the different degrees of humidity are recorded in tables. A description is given of the room in which the work was conducted, and which was under automatically controlled conditions of temperature and humidity obtained by means of electrical connections through a thermograph and a hydrograph, operating respectively a bank of lamps and two atomizers. A list of eight references to the literature cited is presented.

It was found that on account of the wide variations in the size of individual fibers the breaking strength determination as a measure of the strength of wool is unsatisfactory. The microscope was found an ineffective means of making a correction for the diameter of the fibers. A micrometer substituted in place of the lower jaw of the testing machine proved to be very efficient in making this correction and reducing the breaking strength to tensile strength or unit stress. Comparisons of the tensile strengths at five relative humidities showed that the tensile strength of raw wool from four different breeds of sheep decreases as the humidity increases.

Feeding lambs in the fall, H. J. GRAMLICH (*Nebraska Sta. Bul.* 167 (1918), pp. 16, fig. 1).—Feeding tests with lambs were conducted for 58 days from Octo-

ber 5 to December 1, 1917, for the purpose of continuing work on the fall feeding of lambs in cornfields and in blue-grass pasture as compared with dry-lot feeding (E. S. R., 38, p. 271). The lambs fed in the cornfield were handled to determine the advisability of clipping and of feeding oil meal and cottonseed nut cake in addition to alfalfa hay, and the lambs on blue-grass pasture were finished on corn and oil meal. The effect of limiting the corn in the ration and substituting corn silage was studied in the dry-lot groups. The lambs were divided into eight lots, all fed alfalfa hay and as follows: Lot 1, corn; lot 2, corn and silage; lot 3, a light feed of corn and a heavy feed of silage; lot 4, kept in cornfield; lot 5, clipped lambs fed the same as lot 4; lot 6, kept in the cornfield and fed oil meal; lot 7, kept in the cornfield and fed cottonseed nut cake; and lot 8, kept on blue-grass pasture, supplemented with corn and oil meal. The feeds used in the experiment were estimated at the following values: Old corn, \$1.68 per bushel; new corn, \$1.40 per bushel; cottonseed nut cake and oil meal, each \$60 per ton; alfalfa hay, \$25 per ton; and silage, made from corn with very few or no ears, \$6 per ton. In all cases the estimated cost per pound of gain also included the cost of a small quantity of oats fed at the beginning of the experiment.

Lots 1, 2, and 3 were used in studying the substitution of silage for part of the corn ration under dry-lot conditions. The average daily gain for the three lots was 0.325, 0.256, and 0.164 lb., and the cost per pound of gain 16.85, 14.9, and 17.41 cts., respectively.

In studying the relative values of feeding in the dry lot and the cornfield, lot 1 was compared with lot 4, which made an average daily gain per head of 0.344 lb. The total cost per pound of gain in lot 4 was only 10.02 cts.

The effect of clipping lambs fed in the cornfield during the fall was studied with lots 4 and 5. The average daily consumption of food per lamb in lot 5, which was clipped, was lower, and brought the cost per pound of gain down to 8.74 cts., but the unclipped lot sold for 16.4 cts. and the clipped lot for only 12.5 cts. Owing mainly to this difference in price, clipping is regarded as inadvisable.

The results secured with lots 4, 6, and 7 were compared to determine the value of adding a protein concentrate to the ration when fattening lambs in the cornfield. The cost per pound of gain for lot 6 was 9.8 cts, and for lot 7, 10.49 cts., and the average daily gains per head 0.408 and 0.383 lb., respectively.

Lot 8 compared with lots 1 and 6 to study the relative values of feeding on blue-grass pasture with the dry lot and the cornfield made an average daily gain per head of 0.245 lb. The cost per pound of gain, including a charge of one-half cent per day for grass, was 8.32 cts. The lambs on blue-grass pasture lacked finish and on slaughter produced watery carcasses. On account of this condition they brought only 15.9 cts. per pound. Otherwise lot 8 made the most profit and the cheapest gain.

[Experiments with sheep and swine], R. H. WILLIAMS and W. S. CUNNINGHAM (*Arizona Sta. Rpt. 1916, pp. 281-288*).—The experiments with sheep were in continuation of work previously noted (E. S. R., 35, p. 565). The weights of the wool clips of various crosses of sheep were studied and the results for a period of six years are presented in tables. The average weight of the first three clips was 6.8 lbs. for the Tunis-native cross, 6.78 lbs. for the Shropshire-native cross, 6.6 lbs. for the pure Shropshire, 6.57 lbs. for the pure Tunis, and 6.33 lbs. for the Hampshire-Tunis-native cross. The results seemed to indicate that Hampshire blood tends to reduce the weight of the fleece, while Tunis and Shropshire blood gives a relatively higher weight of clip. A comparison of the average weight of clips of sheep having had six clips showed that the third clip was the heaviest, the fifth clip standing second and the second clip third.

The results of a twin inheritance study showed that single ewes had produced 58.65 per cent single lambs and twin ewes 55.55 per cent. The tabulated records

of monthly gains in weight in lambs show that the highest gains for the flock were made in February and that for each following month the gains decreased until June. July was especially warm and trying, and many lambs actually lost in weight. On December 1, 1916, it was found that the Tunis lambs ranked lowest in average weight with 63.6 lbs. per head and the Hampshire-Tunis-native lambs highest with 84.2 lbs.

For the purpose of studying the feeding qualities of Tepary beans two feeding tests were conducted. In the first a young pig, weighing 30 lbs., was fed on cracked Tepary beans alone with the result that on account of the unpalatable nature of the food the pig lost 8.25 lbs. in 35 days. In the second test the beans fed either cracked or finely ground and mixed in equal weights with rolled barley failed to prove palatable, and it was not until the beans were cooked, either ground or whole, that the pigs consumed them greedily. Two pigs fed on rolled barley alone in this trial made gains at a cost of 8.56 cts. per pound as compared with 18.83 cts. for the pigs fed the mixture of Tepary beans and rolled barley. The rolled barley was valued at 1½ cts. and the Tepary beans at 3 cts. per pound.

Growing pigs in summer, W. P. SNYDER (*Nebraska Sta. Bul. 165 (1918), pp. 16*).—The results of a number of feeding tests with pigs at the North Platte substation are reported.

In 1916 a 2 per cent or medium ration of corn was compared with a full ration of corn and with a self-fed ration of corn and tankage for pigs on alfalfa pasture. For the comparison of the 2 per cent and full rations of corn 20 pigs for 70 days were fed 1.8 lbs. of corn daily per 100 lbs. of their weight, while 20 similar pigs received through a self-feeder a full ration, which amounted to 3.74 lbs. daily per 100 lbs. of their weight. At the beginning of the test the pigs averaged 43 lbs. in weight and at the close those on the 2 per cent ration 84 lbs., and those on the full ration 110 lbs., representing a daily gain per pig of 0.58 and 0.95 lb. respectively.

In the comparison of the 2 per cent corn ration with the self-fed ration of corn and tankage two lots of 20 pigs each were used. One lot was given 1.83 lbs. of corn per 100 lbs. of the pigs' weight and the other, the self-fed lot on the same basis, consumed 4.16 lbs. of corn and tankage. In addition two other similar lots were also grazed on alfalfa pasture and fed the same grain rations but the self-fed pigs of these two lots ate 5.02 lbs. daily per 100 lbs. of their weight. The average daily gain per head of the two lots fed the medium ration was 0.53 lb. and of the other two lots 0.87 lb. Feeding the medium corn ration produced 100 lbs. increase in weight with 192 lbs. of corn while the use of the self-fed ration of corn and tankage required 294 lbs. of corn and 10 lbs. of tankage. Estimating corn at \$1.40 per bu., tankage at \$100 per ton, and hogs at \$15 per 100 lbs., the cost of grain per 100 lbs. of gain from the medium corn ration was \$4.80, and from the corn and tankage ration was \$7.85, and the daily profit per pig 5.4 cts. from the medium ration and 6.5 cts. from the full ration.

In 1914 12 lots of shotes each were grazed on alfalfa pasture for an average of 65 days, and 6 of these lots were fed 2.42 lbs. of corn daily per 100 lbs. of live weight, while the other 6 lots received similarly 2.37 lbs. of feed consisting of 95 parts of corn and 5 parts of tankage. The average weight of the shotes at the beginning of the test was about 60 lbs. At its close the corn fed lots averaged 108 lbs. each and those fed corn and tankage 112 lbs., the average daily gain per shote being 0.78 and 0.85 lb. respectively. The corn fed lots made 100 lbs. of gain on 262 lbs. of corn and the other lots on 240 lbs. of the corn and tankage mixture. Estimating values the same as in the preceding

experiment the corn fed lots gained 100 lbs. at a cost of \$6.55 for the corn eaten, while the other lots made an equal gain at a cost of \$6.60 for the corn and tankage consumed.

In 1916 2 lots of 20 pigs each were kept on alfalfa pasture for 70 days, one lot being self-fed corn and the other self-fed corn and tankage. The pigs of the first lot made an average daily gain of 0.957 lb. each and those of the second a similar gain of 1.03 lbs. Of corn alone 300 lbs. and of corn and tankage 293 lbs. were required per 100 lbs. of gain, the cost, calculated on the same basis of values as given above, being \$7.50 and \$7.57, respectively.

Continuing previous work (E. S. R., 33, p. 376), a test was made in 1915 to determine the effect of soaking corn from one feeding time to the next for pigs on alfalfa pasture. The results from feeding dry corn and soaked corn were practically the same, the average daily gain per pig fed dry corn being 0.48 lb. and of those fed soaked corn 0.47 lb.

To determine the value of pasture three lots of 20 pigs each were fed corn and 60 per cent protein tankage in self-feeders in 1916 while running in fields of alfalfa and three similar lots were fed the same ration but were kept in dry lots. Two lots were on trial 56 days, two 42 days, and two 70 days. The results showed that the pigs on alfalfa made an average daily gain per head of 0.87 lb. as compared with 0.32 lb. for the pigs in the dry lots. To produce 100 lbs. of gain the pigs in the dry lots ate 596 lbs. of corn and 23 lbs. of tankage while those on alfalfa pasture ate only 297 lbs. of corn and 14 lbs. of tankage, the cost, based on the values given above, being \$15.47 and \$8.12, respectively. Some of these pigs taken from the dry lots, placed in an alfalfa field for 42 days and self-fed corn and tankage made a daily gain of 1.35 lbs. per pig as compared with 0.24 lb. in the dry lot. In the alfalfa field they produced 100 lbs. of gain with 277 lbs. of corn and tankage, while in the dry lot 710 lbs. were required.

A lot of 10 pigs fed a full ration of 95 parts of corn and 5 parts of tankage in a dry lot in 1918 made an average daily gain of 0.43 lb. each and consumed 514 lbs. of corn and 33 lbs. of tankage per 100 lbs. of gain.

The results of comparisons of hand feeding and self-feeding of spring pigs on alfalfa pasture are also reported. One of these tests gave inconclusive results, while the others indicated an advantage in favor of self-feeding, chiefly because it gave the pigs an opportunity to eat all they wanted. This was especially the case when feeding ground wheat of poor quality, of which the pigs apparently were unable to eat a full feed quickly.

[Feeding experiments with swine], F. C. MINKLER (*New Jersey Stat. Rpt. 1916, pp. 113-132, fig. 1*).—The work of the department of animal husbandry of the station is briefly reviewed, and experiments with different forage crops for hogs in continuation of studies already noted (E. S. R., 36, p. 867), are reported together with the results of several feeding tests with swine.

Results secured for three years indicated that a seed mixture of 6 lbs. of Dwarf Essex rape and 18 lbs. of sweet clover provides a forage crop combination well adapted to economic pork production. A half-acre plat of alfalfa is reported as having furnished forage for 3,200 lbs. of live weight of hogs for nearly 30 days. A combination seed mixture of oats and peas, each 30 lbs., alsike clover, red clover, and sweet clover, each 8 lbs., and rape 6 lbs. per acre, as a forage crop for hogs is recommended as furnishing pasturage early in the season and supplying forage even after the first frosts check the growth of the plants. A plat of 2.3 acres of rye was used successfully for providing early spring forage for brood sows and their litters. General notes are further given with reference to the use of several forage crop mixtures and of mangels for feeding brood sows and pigs.

The value of molasses and ground alfalfa was compared with corn and alfalfa hay in a 31-day feeding test with 21 brood sows, divided into three equal lots. During the test lot 1 consumed 1,302 lbs. of corn, 310 lbs. of alfalfa hay, and 1,080 lbs. of mangels; lot 2, 1,302 lbs. of corn, 310 lbs. of alfalfa hay, 62 lbs. of tankage, and 1,080 lbs. of mangels; and lot 3, 1,550 lbs. of equal parts of ground alfalfa hay and black strap molasses, 73.78 lbs. of tankage, and 1,080 lbs. of mangels. The average daily gain per sow for the 3 lots was 1.078 lbs., 0.875 lb., and 1.43 lbs., respectively, and the cost per pound of gain 10.47, 13.71, and 5.45 cts., respectively. The smaller gains made by lot 2 are considered due largely to the higher average condition of this lot at the beginning of the trial. Lot 3, as compared with other lots consumed from 80 to 100 per cent more water daily and after the test presented a better condition of coat and quality of flesh. The results are considered as clearly demonstrating that alfalfa meal is the best form in which alfalfa hay may be fed to brood sows. No definite conclusions are drawn regarding the value of the molasses mixture from this single test covering so short a period.

An experiment was also conducted with breeding gilts to determine the practicability of replacing corn with molasses. Two lots of 5 uniform gilts each were on trial from May 1 to September 5. Lot 1 was fed corn, tankage, and alfalfa hay and lot 2 the same proportion of nutrients in the form of molasses and ground alfalfa with limited amounts of digester tankage. Green pasture was substituted for the alfalfa hay during the summer. Lot 1 made an average daily gain per pig of 0.822 lb. and consumed at the rate of 3.94 lbs. of feed per pound of gain, at a cost of 5.59 cts., and lot 2 made an average daily gain per pig of 0.69 lb. and consumed at the rate of 5.83 lbs. of feed per pound of gain, at a cost of 5.03 cts. Body measurements made of each pig in the two lots are recorded, together with other results of the test. The corn-fed lot produced the thriftest pigs, otherwise the general condition of the two lots was quite similar. Lot 2 took from 2 to 2½ times the quantity of water consumed by the corn-fed lot and also consumed considerably more forage.

Feeding trials with market pigs on forage crops and in the dry lot and in hogging down corn are reported. The results secured with different forage crops indicated that a good stand of alfalfa is quite as efficient and will produce approximately as much pork per unit of area as rape or other combinations of forage crops tried out at this station. The pigs fed in the dry lot were divided into three groups for the comparison of tankage and peanut meal fed with corn and middlings, and of tankage fed with hominy meal and middlings. Although no ill effects were produced from feeding the ration containing the peanut meal it was observed that the animals apparently tired of the feed from time to time. The pigs failed to respond in the same degree to the feeding of hominy meal as to the feeding of corn. In hogging down corn the pigs became adapted readily to the ration of new corn and the field was cleaned up with practically no waste.

Experiments in hog feeding, G. R. EASTWOOD (*Ohio Sta. Bul. 323 (1918), pp. 276-279*).—Five sows with 38 spring pigs were turned on two acres of clover from June 9 to September 4, 1916. During the period of the trial the lot consumed, in addition to the pasture, 4,695 lbs. of corn and 295.75 lbs. of tankage, and made a total gain of 1,452 lbs., or an average gain per head of 0.39 lb. The sows lost 155.5 lbs. in weight, while the pigs gained 1,607.5 lbs. during the trial.

On September 4 the pigs were weaned and transferred to one acre of clover in rye stubble. During the next 31 days they consumed 1,720.5 lbs. of corn and 279 lbs. of tankage, and made a total gain of 702 lbs., an average gain per head of 0.612 lb.

In another trial 18 pigs weighing approximately 104 lbs. on the average were turned on an acre of clover June 8, 1916, and remained 53 days. They consumed during the period 2,682 lbs. of corn and 10 lbs. of tankage and made a total gain of 936 lbs., or an average daily gain per head of 0.98 lb.

For the purpose of comparing clover pasture with hogging down rye 18 pigs, on July 31, 1916, were divided into two lots, weighing 1,404.5 lbs. and 1,406.5 lbs., respectively. One lot was fed ear corn and allowed to run on three acres of previously pastured clover, and the other lot was allowed to hog down two acres of rye seeded to clover, which had made some growth. Both lots received about 0.2 lb. of tankage daily per head. The standing rye was estimated to contain 640 lbs. of grain. The lot on clover pasture at the close of the trial September 4 had consumed 1,255.5 lbs of corn and made a total gain of 338.5 lbs., while the lot on standing rye had consumed 640 lbs. of rye and made a total gain of 123 lbs.

The results of an experiment in hogging down corn conducted with 18 heavy and 37 light pigs, the average weight being approximately 196 lbs and 75 lbs., respectively, showed that the larger hogs made an average daily gain of 2.01 lbs. per head, and on the basis of live hogs at \$9.50 per hundredweight gave a return of \$1.06 per bushel for the corn consumed, while the smaller hogs made an average daily gain of 1.31 lbs. per head and returned \$1.15 per bushel for the corn. The smaller lot at the close of this test was transferred to another field of 3 acres, estimated to yield 42.5 bu. per acre, which they hogged down in 25 days, making an average daily gain of 1.37 lbs. per head, but returning only 90 cts. per bushel for the corn on the same basis.

Hogging down corn, W. L. ROBISON (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 229-232).—The results of several tests in hogging down corn are briefly discussed.

The data secured in three consecutive years are regarded as indicating that twenty 100-pound pigs may be expected to clean up an acre of corn yielding 50 bu. in about 20 days. It is stated that on this same basis eight to nine shotes, weighing from 120 to 130 lbs. will harvest an acre in as many days as the corn yields bushels. The gross returns per acre of corn yielding 50 bu. for four tests extending over three years ranged from \$72.95 to \$86.70, the value of the hogs being estimated at \$14 per hundredweight. A test of the value of feeding tankage when hogging down corn indicated that at least as much as 0.2 to 0.3 lb. of tankage daily per head, or an equivalent amount of some other nitrogenous concentrate, will prove economical.

A trial to compare heavy and light pigs for hogging down corn noted on page 778 is included.

A comparison of hogging down corn and dry lot feeding resulted in a daily gain per head of 1.312 lbs. for the pigs on the field and of 0.861 lb. for those in the dry lot. Both lots were fed 0.5 lb. of tankage daily per pig for nearly the entire period of the test, but this is regarded as rather too large an allowance for the most economical gains. Eight pigs averaging 110 lbs. when turned into a field required 28 days for harvesting 0.5 acre of corn. When most of the corn was consumed the pigs were left in the field three days longer to clean up what remained, but during this time they lost a total of 13.5 lbs. in weight.

Systems of hog farming in the Southeastern States, E. S. HASKELL (*U. S. Dept. Agr., Farmers' Bul. 985* (1918), pp. 38, figs. 12).—This publication discusses the place of hog raising in the farm business, describes the farm organization of several well managed hog producing farms in the southeastern coastal plain region for the purpose of illustrating well balanced grazing systems, good hog management, and profitable production, and considers together with the size of the herd, farrowing and marketing, and hog diseases, the expenses other

than for feeds which are connected with hog farming. The different grazing crops available in the region are briefly noted and a grazing system is suggested. The data were secured in cooperation with the Georgia State College of Agriculture.

[Studies of nutrition, incubation, management, and marketing problems with poultry], H. R. LEWIS and W. C. THOMPSON (*New Jersey Stat. Rpt. 1916*, pp. 148-162, 168-187, fig. 1).—Experiments were in progress to determine the value of different milk products, sour skim milk, different commercial grades of meat scrap and ready-mixed poultry feeds, and the effect of pineal gland secretion on the growth of young chicks. The experiment with commercial milk products did not give very positive results but indicated that to a certain extent these products may replace meat scrap in the rations of laying hens. The cost of feeding milk products was slightly greater than the cost of supplying meat scrap. Good results were secured with feeding chicks sour skimmed milk and the practice is recommended, particularly during the first 10 or 12 weeks.

Chemical analyses made of 12 commercial brands of meat scrap showed a range from 4.4 to 6.4 cts. in the cost per pound of protein. A wide range in quantity was found to exist in the meat scrap, also in the ready mixed poultry feeds in which the foreign material and undesirable seeds varied from 0 to 10 per cent and the nutritive ratios in the mashs from 1:2.5 to 1:5.6 and in the grains from 1:2.9 to 1:6.1, while the total cost of the scratch and mash feeds for 100 birds per day was calculated as varying from 38 to 68 cts.

The feeding of pineal gland secretion failed to show any appreciable advantage. The pineal gland material was taken from slaughtered sheep and was fed mixed with small quantities of wheat bran, slightly moistened with skimmed milk.

The incubation problems studied included methods of artificial incubation, effect of method of turning eggs on position of embryo, variation in water content of eggs as determining the efficiency of the hatch, and effect of time of hatching on the performance and profit from resulting pullets and cockerels. The study of methods of artificial incubation is a survey of the methods practiced in the State and is as yet incomplete. The results with different ways of turning eggs indicated no apparent advantage of any one method, but the experiment is being continued to secure more data before drawing conclusions. No definite correlation was established between a high water content of the egg and low hatchability. The average water content in the albumen of the eggs studied was 87 per cent, with a variation of from 1 to 4 per cent either way. Observations on the effect of time of hatching on the performance and profit from resulting pullets and cockerels are briefly noted as a report of progress.

Under poultry management problems attention was given to determining the error factor in experimental analysis and to evolving a standard unit poultry plant. These lines of work are briefly discussed, and the results of calculating the average cost of rations as based on the average prices of feeding stuffs from November, 1915, to October, 1916, are presented in a table.

Experiments in the preservation of eggs in sodium silicate solutions of various concentrations and by means of commercial egg preservers and other methods are described. It is stated that eggs preserved in a 10 per cent solution of sodium silicate in stone crocks will keep for a period of 12 months and will then be suitable for cooking in any manner. Different commercial containers were used in the parcel post shipment of eggs, and the results are briefly noted.

The general activities of the poultry department of the station, including the Vineland egg laying and breeding contest, are described.

Breeding problems [with poultry], H. R. LEWIS and W. C. THOMPSON (*New Jersey Stas. Rpt. 1916*, pp. 142-147).—Studies in progress on inheritance of color pigment, egg-shell color, and fecundity, variation in strains of Single Comb White Leghorns, and sex sequence, are briefly described and some results are reported.

In studying egg-shell color with 135 Barred Plymouth Rock, 120 Single Comb White Leghorn, 25 Rhode Island Red, and 24 Light Brahma pullets during the year, 23 different colors were determined and are recorded in order of color sequence. To a certain extent the shade of egg-shell color appeared to be a breed characteristic. A decided reddish blue tint noted in about 80 per cent of the Light Brahma eggs was only rarely observed in the eggs of the Barred Plymouth Rock and the Rhode Island Red, in which no striking difference was found. At least 50 per cent of the birds showed a very marked variation in the color of their eggs, individuals laying in sequence eggs of uniform color being the exception. Feeding and environment seemed to have no effect on egg color, and it is believed therefore that it may be rather a question of breeding.

In the study of fecundity White Leghorns are used and a section of a limited family produced during the year over 200 eggs each in 10 months from November to August.

Natural incubation and brooding, W. F. SCHOPPE (*Montana Sta. Circ. 74* (1918), pp. 79-86, figs. 3).—The selection and care of setting hens and the care and management of the chicks are discussed, and several rations are recommended.

The back yard poultry flock, H. R. LEWIS (*New Jersey Stas. Hints to Poultrymen*, 6 (1918), No. 11, pp. 4, fig. 1).—Brief suggestions are given for producing poultry and eggs under city or suburban backyard conditions.

Preserving eggs for winter use, H. E. DVORACHEK and S. R. STOUT (*Arkansas Sta. Bul. 152* (1918), pp. 3-12, figs. 7).—An experiment was undertaken to determine the practicability and economy of preserving eggs during the spring and summer months for fall and winter use. Fertile and infertile, brown and white shell, and washed fertile eggs were preserved in water glass, limewater, dry salt, vaselin, and three proprietary egg preservatives. After six to seven months in the preservatives, the cooking qualities of the various lots were tried out.

Water glass and limewater gave about equal results, and eggs preserved in either of these solutions were as good as fresh eggs for all purposes except poaching. Eggs preserved in salt were salty and when used in custard had a peculiar alkaline flavor. They also evaporated badly. The patent preservatives and vaselin were unsatisfactory. The color of the shell did not seem to have any influence on the keeping qualities of eggs in the preservatives tested. Infertile eggs were slightly superior to fertile eggs, especially with the patent preservatives. Soiled fresh eggs could be washed and satisfactorily preserved in water glass.

Ostrich investigations, R. H. WILLIAMS and W. S. CUNNINGHAM (*Arizona Sta. Rpt. 1916*, pp. 290-293).—The egg record of the hens for 1915 and 1916 and the total and average weight of the eggs laid are submitted in tables and briefly discussed.

The average number of eggs laid by the flock in 1916 was 29.33. Three crossbred hens made an average of 32.67, four South African 28.75, and two Nubian 25.5 eggs per bird. There was a greater range within the breed than between the averages of the different breeds and conclusions, therefore, as to breed affecting egg production are not considered justified.

The average weight of eggs of the different hens and for the entire flock varied but slightly for the two years, and is believed due to natural development

rather than to feed consumed. The total weight of eggs laid by the different hens ranged in 1916 from 25.86 to 61.234 kg. The average for the flock was 46.33 kg. (102 lbs.). The eggs of the South African hens averaged 1,507 gm., the Nubian 1,597 gm., and the crossbred hens 1,648 gm. in weight.

Report of the assistant biologist, T. C. NELSON (*New Jersey Stat. Rpt. 1916, pp. 401-430, pls. 2, figs. 6*).—A summary of the contributions to the knowledge of experimental oyster culture by the late Dr. Julius Nelson, biologist of the station from 1888 to 1916, is presented and studies made during the year ended October 31, 1916, are described. The purpose of the work during the year was mainly to ascertain what determines the position of a natural oyster reef and why some planted beds are so much better for spatting than others, and to find out whether it is possible, by noting the stage of development of the oyster larvæ, to predict with any degree of certainty when a set will occur and culch should be planted.

Although the spring was backward oyster larvæ were found in the water early in June and were ready to set by the end of the month. It was found possible to predict to within 48 hours the time oyster larvæ begin to set. Observations on the distribution of the larvæ in Little Egg Harbor showed them to occur in the greatest numbers near the head of the bay and to follow the shore line with the ebb and flow of the tide. Comparatively few of the larvæ of this region reached the sea, but those in Great Bay were observed to pass to sea with the ebb tide and to return again during the early part of the flood.

It was noted that oyster larvæ are most numerous in those regions which have proved to be the best setting grounds. Oysters attaching to the bottom of a floating box early in July grew to be $1\frac{1}{2}$ in. across in less than 2 months. The effect of current on the rate of growth was illustrated by oysters 10 months old, averaging from 3 to 4 in. in length, which were taken from positions subjected to a very rapid current. An examination of external growths on the shell of living oysters showed that certain ones, chiefly the red and brown algae, harbor large numbers of food organisms.

DAIRY FARMING—DAIRYING.

Report of the department of dairy husbandry, W. J. CARSON (*New Jersey Stat. Rpt. 1916, pp. 191-233, pls. 4*).—This report reviews the activities of the department, which included the studies of the relation of conformation of heifers to future production and of the value of alfalfa hay and corn meal as a ration for dairy cows, the keeping of records of the average individual production, the cost of production, the cost of raising heifers and calves, and of the changes in the herd as well as of production and feed cost from about 1,000 cows, representing several cow-testing associations, the supervision of advanced registry work, the issuance of tester licenses, and the inspection of dairy glassware. The herd records are reported in detail in tabular form.

The description of the experimental work is mainly a report of progress, only a few definite results being submitted. In the feeding test to determine the value of alfalfa hay and corn meal 2 lots of 4 cows each were used through 2 periods of 30 days each with an intermediate period after which the rations were exchanged. The daily average consumption of the regular ration amounted to 9.16 lbs. of alfalfa hay, 27.43 lbs. of silage, 4 lbs. of beet pulp, and 6.69 lbs. of grain mixture, and the consumption of the limited ration to 23.17 lbs. of alfalfa hay and 7.63 lbs. of corn meal. The average daily milk production on the regular ration was 27.52 lbs. per cow and on the limited ration 25.30 lbs. The average weight of the cows at the close of the test was 988 lbs. and 982

lbs., respectively. Calculating alfalfa hay at \$10 and corn at \$25 per ton, the limited ration was 10.8 per cent cheaper than the regular or mixed ration.

The average production of the herd for the year was 9,505.9 lbs. of milk, an increase of 1,834 lbs. over the average production for the preceding year. The profit per cow was \$125.78 and the feed cost per 100 lbs. of milk produced was \$1.49. Data on the feed cost of raising 34 heifers show that it cost \$40.71 to bring each heifer to an average age of 8.55 months. As compared with the results secured the year before this represents an increase in cost of nearly 50 per cent, which is attributed to the higher cost of feed.

Chopped alfalfa v. bran in grain ration for dairy cows (*Nebraska Sta. Bul. 164* (1918), pp. 11, fig. 1).—The experiments reported were made at the North Platte substation to determine the effect of substituting chopped alfalfa for the wheat bran in a ration of 4 parts of corn, 2 parts of bran, and 1 part of oil meal. Two tests were made, the first extending from December 1, 1916, to January 30, 1917, and the second from March 1 to May 30, 1917.

During the first test the cows were fed about 30 lbs. of silage per head daily and had access to a rack containing alfalfa hay, and during the second test they were also fed silage and alfalfa and in addition had some grass during the last few weeks. One lb. of grain was fed for 3 to 4 lbs. of milk produced. Six pairs of cows were selected for each test and each pair was matched as closely as possible in regard to factors likely to affect production. One cow of each pair was put into the group receiving the wheat bran and the other into the group fed chopped alfalfa instead of the bran. The tests were each extended through four 15-day periods and each period the ration of the one group was exchanged for that of the other. During the second test one cow became sick and she and her mate were therefore eliminated.

On combining the results of the two tests it was found that the 22 cows, during an average period of 75 days they were fed the ration including the wheat bran, produced 22,886 lbs. of milk, containing 794 lbs. of fat, and lost 32 lbs. in weight, and when similarly fed the chopped alfalfa instead of the bran gave 22,741 lbs. of milk, containing 786 lbs. of fat and gained 240 lbs. in weight. It is concluded that in these tests the chopped alfalfa was fully equal to bran.

Effect of rolled barley on alfalfa-beet pulp ration for milk production, R. H. WILLIAMS and W. S. CUNNINGHAM (*Arizona Sta. Rpt. 1916*, pp. 288, 289).—Ten cows were divided into two lots balanced to the extent possible and one was fed molasses-dried-beet pulp as the sole concentrate, while the other received a mixture of equal parts of rolled barley and molasses-dried-beet pulp. Both lots were fed the concentrates at the rate of 1 lb. to 4 lbs. of milk produced and were given all the alfalfa hay they would consume. There were two feeding periods covering a total of 68 days, and during which the rations were alternated. On the ration containing barley the cows produced an average of 7,316.2 lbs. of milk, or 322.8 lbs. more than was secured when they were fed the ration without barley. While the rolled barley increased the total cost of the ration by \$4.75 and the feed cost per 100 lbs. of milk by 1 ct., the increase in milk production netted a profit of \$4.64.

Wintering dairy heifers, R. E. HUNT (*Virginia Sta. Bul. 219* (1918), pp. 3-20, figs. 7).—Rations composed of different concentrates and roughages were compared in three years' work with pure-bred dairy heifers of various ages. The heifers ran in open pens in the day and were stabled at night. In the winter of 1915-16 15 heifers from 6 to 12 months of age were fed for 170 days in three lots of 5 calves each. The daily rations were 25 lbs. of corn silage and 2 lbs. of cottonseed meal for lot 1, 12.5 lbs. of corn silage, 6 lbs. of clover hay, 1 lb. of corn meal, and 1 lb. of cottonseed meal for lot 2, and 12 lbs. of clover hay and

2 lbs. of corn meal for lot 3. After 71.5 days all constituents of the above rations were increased 20 per cent. The average daily gains per head were 1.12 lbs. for lot 1, 1.08 for lot 2, and 1.15 for lot 3.

During the winter of 1916-17 a number of protein supplements for corn silage were compared in a 154-day test involving two lots of 5 and two of 4 heifers each. All the animals were fed 25 lbs. of corn silage per head, and in addition 2 lbs. of cottonseed meal for lot 1, 2.5 lbs. of linseed meal for lot 2, 5 lbs. of wheat bran for lot 3, and 2.5 lbs. of peanut meal for lot 4. The average daily gains per heifer were 1.06 lbs. for lot 1, 1.1 for lot 2, 0.85 for lot 3, and 0.96 for lot 4.

The following winter corn silage was used for roughage and the concentrates consisted of soy bean meal, peanut meal, and velvet bean meal. In this test lots 1 and 2 contained six 5-month-old heifers each, and lots 3 to 5, five 20-month-old heifers. The younger heifers were fed 20 lbs. of corn silage per head daily, and the older ones 30 lbs. In addition 1.5 lbs. of soy bean meal was fed to lot 1, 2 lbs. of peanut meal to lot 2, 1.75 lbs. of velvet bean meal to lot 3, 2.3 lbs. of peanut meal to lot 4, and 3.5 lbs. of velvet bean meal to lot 5. The average daily gains per head for the 98 days were 0.8 lb. for lot 1, 0.61 for lot 2, 0.34 for lot 3, 0.4 for lot 4, and 0.6 for lot 5.

It is noted that the peanut meal fed in 1916-17 was from hulled peanuts and contained 45 per cent protein and only 5.2 per cent crude fiber, whereas that used in 1917-18 was from whole peanuts and contained 30 per cent protein and 27 per cent crude fiber.

A Wisconsin register of production, N. NEGLEY (*Hoard's Dairyman*, 55 (1918), No. 15, pp. 655, 667, figs. 3).—An account is given of the formation of the Wisconsin register of production, in which any cow completing a year's record in any regularly organized cow testing association in Wisconsin and making not less than 365 lbs. of milk fat during the association year is eligible, under certain conditions, for entry. A yearbook is to be issued giving a list of the cow testing associations in the State and full information in reference to the production, age, breed, etc., of each cow qualified for the registry. The text of the rules and regulations governing this register is included.

Investigation of the cost of milk production in western Washington, F. W. RADER (*Washington Sta., West. Wash. Sta. Mo. Bul.*, 6 (1918), No. 5, pp. 63-69).—Records taken on 89 farms, mostly from March 1, 1917, to March 1, 1918, and representing 2,028 cows, are tabulated in detail and discussed as to the various factors entering into the cost of milk production.

It was found that on these farms the average annual production per cow was nearly 7,000 lbs. of milk, produced at an average cost of 3.29 cts. per pound. This showed an average loss of 0.48 ct. per pound on the basis of the individual profit and loss statements rendered.

The pure milk problem, R. J. CAEVER (*Vet. Alumni Quart. [Ohio State Univ.]*, 5 (1918), No. 4, pp. 90-96).—A discussion of the sanitary phase of the problem of a pure milk supply for large cities.

The dairy industry in the Philippines and its possibilities, L. G. MENDOZA (*Philippine Agr. and Forester*, 6 (1917), No. 4, pp. 104-115).—This article treats of the history of the dairy industry in the islands previous to the American occupation, conditions surrounding the industry at present, possibilities of the carabao as a dairy animal in the Philippines, the dairy industry in other tropical countries, modern dairy farms in the Philippines, and native milk by-products.

The amount of milk usually produced by the native carabao under ordinary farm conditions varies from 0.3 to 7 and 8 liters per day. The dairy carabao is usually at her best at the third calving, between five and six years old, and

between two and five months of lactation. Milk is not marketed until the calf is one month old. The lactation period is usually one year or more. Tabulated results are given of analyses of 10 samples of milk from carabaos from 3 to 16 years of age and from 3 to 5 months in lactation. These analyses give averages as follows: Specific gravity, 1.0349; fat, 6.84 per cent; protein, 4.97; casein, 4.45; lactose, 5.16; ash, 0.83; and solids-not-fat, 10.95.

Efforts to grow pure-bred cattle from the Temperate Zone in the Philippines have not met with success, although successful dairy farms are in operation in the suburbs of Manila, the herds of which consist of cows imported from Australia.

The crude methods used in the making of native Laguna and Bulacan cheeses and native butter from cheese are outlined. A bibliography is included.

Dairy industry in Sao Paulo, C. L. HOOVER (*U. S. Dept. Com., Com. Rpts., No. 50 (1918), pp. 790, 791*).—Notes are given on the present condition and future prospects of the dairy industry in Sao Paulo.

The relation of *Oidium lactis* and *Penicillium* to the keeping qualities of butter, W. B. COMBS and C. H. ECKLES (*Jour. Dairy Sci., 1 (1917), No. 4, pp. 347-355, figs. 3*).—The object of the experiments here reported was to determine the relation of *Oidium lactis* and *Penicillium chrysogenum* to the keeping qualities of butter, especially when the organisms had developed in cream before churning.

Pure cultures of these molds grown upon samples of sweet cream were detrimental to the quality of the cream as judged from the standpoint of the practical butter maker. However, when the same molds were grown upon sour cream no ill effects whatever upon the quality of the cream could be observed. Mold growth upon either sweet or sour cream had a pronounced ill effect upon the keeping quality of the resulting butter. Experiments were conducted to ascertain the cause of this detrimental effect of molds.

It was found that butter from cream containing enormous numbers of mold spores and butter into which large numbers of mold spores were worked failed to show mold growth on the surface. The actual number of mold spores was found to decrease when such butter was stored in dry and humid atmospheres for 30 days.

Another series of experiments was conducted to determine if the enzymes produced by the molds while growing upon cream were the cause of the rapid deterioration of the butter made from such cream. In these tests batches of cream containing large quantities of both molds were pasteurized at different temperatures, promptly cooled, and churned. It was found that the keeping quality of the resulting butter was greatly improved when the cream was pasteurized at 145° F. Pasteurization at 160° was even more effective, and at 212° the deterioration due to the presence of the mold seemed to be entirely removed. Butter made from batches of this cream which had not been pasteurized went off flavor very rapidly and was unfit for human consumption by the end of 45 days. These results are interpreted to mean that the decidedly better keeping quality of butter made from pasteurized cream is due to the destruction of enzymes formed in the cream by molds.

Tallowy butter.—Its causes and prevention, O. F. HUNZIKER and D. F. HOSMAN (*Jour. Dairy Sci., 1 (1917), No. 4, pp. 320-346*).—The authors first distinguish between rancidity and tallowiness in butter and discuss the occurrence, characteristics, and conditions which produce tallowy butter. Experiments are next reported upon the effect on the production of tallowy flavor in butter of such substances as iron and copper and their hydroxids; the hydroxids of iron, copper, nickel, tin, brass, and German silver in the presence of lactose, curd, alkali, and acid, respectively, in the butter and milk fat; and of the treatment of the wrapper with chemicals.

From the results it is concluded that tallowiness in butter is the result of an oxidation process. If this oxidation takes place in the milk fat alone it is suggested that the compound causing tallowiness is derived from free glycerol produced by a slight or partial hydrolysis of the fat. This compound appears to be glycollic acid. It was found that lactose in a neutral or slightly alkaline medium very greatly intensifies the results of oxidation, due to the fact that simultaneously with the fat the lactose is also subject to mild oxidation, producing an excess of glycollic acid, while in the case of pure fat alone the formation of glycollic acid from the small amount of glycerol alone is much slower.

The conditions and agencies favoring oxidation are (1) exposure of butter or milk fat to air, especially in the presence of light and high temperature, (2) the presence in butter or milk fat of oxidizing agents such as metals or metallic salts which act as oxygen carriers or catalyzing agents, and (3) the presence of an unnatural alkaline condition of the butter or cream from which the butter is made, which accelerates any oxidizing action by making the compounds oxidized more susceptible to oxidation. The application of these findings to commercial conditions is pointed out.

Facts about butter and suggestions for a standard (*Amer. Assoc. Creamery Butter Manfrs. Bul. 12 (1918), pp. 32*).—Suggestions are presented for a standard for commercial butter, special attention being given to the moisture and fat content of butter and the pasteurization and neutralization of cream in butter making.

Laws of California relative to production and standard of dairy products (*San Francisco: State Dairy Bureau, 1917, pp. 51*).—The laws of California relating to the production and standard of dairy products are compiled, and the decisions of California and other courts construing the various statutes are briefly annotated.

Dairy laws of Iowa, 1917 (*Des Moines, Iowa: State, 1917, pp. 12*).—The text is given of these laws as amended at the 1917 session of the General Assembly.

VETERINARY MEDICINE.

Laboratory methods of the United States Army (*Philadelphia: Lea & Febiger, 1918, pp. 256, figs. 5*).—This manual is a collection of formulas and technical methods for use in stationary and field laboratories of the United States Army. It contains sections on collection and shipment of specimens and materials, solutions and stains, clinical pathological work, quantitative analytical methods, general bacteriological methods, special bacteriological methods, and sanitary examination of milk, water, and sewage. The manual has been compiled largely by members of the Surgeon General's staff. The section on quantitative analytical methods was written by D. D. Van Slyke.

Behavior of hypochlorite and of chloramin-T solutions in contact with necrotic and normal tissues in vivo, J. H. AUSTIN and H. D. TAYLOR (*Jour. Expt. Med.*, 27 (1918), No. 5, pp. 627-633, figs. 3; *abs. in Vet. Rev.*, 2 (1918), No. 3, pp. 327, 328).—A comparison of the behavior of Dakin's hypochlorite and chloramin-T solutions in contact with necrotic and normal tissues in vivo was made as follows:

The tissue of the left ears of rabbits was rendered necrotic by exposure to the rays emitted by a Coolidge tube. Both ears of the rabbit were then suspended for 20 minutes in separate beakers containing 400 cc. of the solution to be tested. The solution was titrated with $\frac{N}{10}$ sodium thiosulphate solution immediately after the 20 minutes' exposure, 2 hours later, and 17 hours later.

From the results obtained the authors conclude that the fall in chlorin concentration of Dakin's hypochlorite solution is more rapid in contact with necrotic tissue than with normal tissue. The fall in chlorin concentration of chloramin T is very slight with necrotic tissue and negligible with normal tissue. The hypochlorite solution is more erosive and irritating to the skin than chloramin T, but is superior in its cleansing ability on necrotic tissue. It is concluded that the irritating effects must be due to the readily available chlorin.

The antigenic properties of gelatin, W. A. STARIN (*Jour. Infect. Diseases*, 23 (1918), No. 2, pp. 139-158).—This article reports a detailed immunological study of gelatin. A study of the results of anaphylactic, precipitin, complement binding, and meiostagmin reactions showed that all were constantly negative with gelatin as an antigen in rabbits, guinea pigs, and dogs. The gelatin used in these experiments had only a slight toxicity for the animals employed, and there was no evidence of any cumulative action of toxicity. The cause of the lack of antigenic property exhibited by gelatin has not been determined.

Biological products (*Pub. Health Rpts. [U. S.]*, 33 (1918), No. 22, pp. 869-872).—A list is given of the establishments licensed for the propagation and sale of viruses, serums, toxins, and analogous products.

Annual report of the veterinary board of health of Copenhagen for the year 1916, P. HANSEN (*Aarsber. Vet. Sundhedsr.*, 1916, pp. XIV+196).—An annual report dealing with the diseases of live stock, etc.

Veterinary service and meat inspection in Norway in 1915 and 1916 (*Norges Off. Statist.*, 6. ser., 1915, No. 96, pp. 223; 1916, No. 121, pp. 154).—These reports consist in large part of statistical data.

Report of the government veterinary surgeon for 1917, G. W. STURGESS (*Ceylon Admin. Rpts. 1917, Sect. IV, pp. F1-F6*).—This, the usual annual report, includes an account of the occurrence and work with infectious diseases of live stock.

Range plants poisonous to sheep and cattle in Nevada, C. E. FLEMING (*Nevada Sta. Bul.* 95 (1918), pp. 51, pls. 6, figs. 23).—This is a summarized account of the more important poisonous range plants of Nevada, including larkspur, death camas, lupine, water hemlock, western goldenrod, rabbit brush, loco, and false hellebore. It furnishes practical information on the poisonous plants responsible for the greater part of the live stock losses and methods of handling by which the losses may be reduced. A Spanish translation of part of the bulletin, by B. F. Schappelle, is attached.

A new poisonous plant, the whorled milkweed (*Asclepias verticillata*), G. H. GLOVER, I. E. NEWSOM, and W. W. ROBBINS (*Colorado Sta. Bul.* 246 (1918), pp. 3-16, figs. 13).—Investigations have shown that the very serious losses of sheep annually experienced in western and southwestern Colorado are largely the result of poisoning by whorled milkweed, and the present preliminary account has been prepared in order that stockmen may become familiar with its habits of growth, habitat, and geographical distribution, and the symptoms of poisoning and guard against it. This plant, suspected in December, 1909, of being poisonous, has been responsible for the loss of large numbers of sheep, as many as 750 of a band of 1,400 having been reported as lost through poisoning by whorled milkweed at Cortez, Colo., in the fall of 1916.

The plant is a native of Arizona, New Mexico, Colorado, Utah, Nebraska, and the States eastward, being found in Colorado at low altitudes, seldom occurring above 6,000 ft., except in certain parts of the Southwest. It makes its appear-

ance the latter part of May or the first of June but most cases of poisoning have occurred in the fall and winter on the dried plants.

Field observations and laboratory experiments indicate that it is poisonous at all stages and does not lose its toxicity by drying. Feeding experiments reported seem to show that it is quite toxic for both sheep and rabbits and that previous difficulties in determining its toxicity rested largely in the inability to get animals to eat the dry plant even when hungry. They seem to eat the green plant quite readily and apparently only a very small amount is required for destruction. Sheep evade the milkweed, however, when more palatable plants are present, and it is only when they are hungry and can find little else that they eat it.

"In the few cases observed in the field and in those animals poisoned experimentally the following symptoms in sheep have predominated. First, there is dullness, the animal rapidly becoming comatose; this is followed by convulsions at irregular but at shorter intervals until death. The heart beat is at first very rapid, becoming gradually weaker. There may or may not be a rise in temperature. The pupils of the eyes are widely dilated. Autopsy reveals no characteristic lesions. The lymph glands are injected in many cases, likewise the trachea. There is no evidence of irritation in the digestive tract."

Dependence must be placed upon prevention of losses through eradication of the plant from infested fields, orchards, corrals, etc., since no specific remedy for milkweed poisoning has been found.

Larkspur or "poison weed," C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr., Farmers' Bul. 988 (1918), pp. 15, figs. 6*).—A revision of Farmers' Bulletin 531, previously noted (*E. S. R.*, 29, p. 280). A detailed technical account has also been noted (*E. S. R.*, 35, p. 779).

Botulism: A method of isolating *Bacillus botulinus* from infected materials, E. C. DICKSON and GEORGINA E. BURKE (*Jour. Amer. Med. Assoc.*, 71 (1918), No. 7, pp. 518-521).—The technique is given of the preparation of three kinds of culture media, glucose-infusion agar, glucose-infusion broth, and sheep's brain medium, which the authors have found satisfactory for the isolation and growth of *B. botulinus* in cases of food poisoning. The points considered essential for the identification of *B. botulinus* are "(1) the demonstration of large, Gram-positive bacilli with rounded ends and terminal spores, (2) the occurrence of anaerobic growth of characteristic appearance in glucose-agar cylinders with formation of gas and fragmentation of the medium, (3) the blackening of brain medium, and (4) the characteristic growth in glucose-infusion broth, with the production of a virulent toxin which can be demonstrated in filtered broth by the inoculation of susceptible animals, and which is neutralized by specific antitoxic serum prepared by immunizing goats to the toxin of known *B. botulinus*."

The specificity of anaplasmas, J. M. QUEVEDO (*Rev. Soc. Med. Vet. [Buenos Aires]*, 3 (1917), No. 1, pp. 11-26, figs. 7).—The author concludes, from the studies here reported, that anaplasmas constitute a species of *Hæmosporidia* which is the cause of a particular disease, the anaplasmosis of bovines.

The virulence of the blood of animals affected with foot-and-mouth disease, G. COSCO and A. AGUZZI (*Rev. Gén. Méd. Vét.*, 27 (1918), No. 318, pp. 233-240).—This is a continuation of investigations previously noted (*E. S. R.*, 37, p. 689).

A study of the virulence of blood serum and red blood corpuscles at different stages of the disease showed that in the majority of cases the virulence of the red corpuscles reaches its height at the beginning of the second and third periods of fever, diminishing as the temperature rises. On the contrary, the serum is more virulent when the fever has reached its height. In equal doses the serum

seems to be more virulent than the blood corpuscles. The serum becomes inactive after 21 days in the refrigerator, while the red corpuscles remain virulent even after 32 days. Ten cc. of red corpuscles, extracted at the most favorable time, are capable of producing the disease, while the serum can produce the disease in minimal doses of 0.25 cc. In successive passages through six animals the virulence of the corpuscles was markedly increased. Inoculation by ingestion was found to give negative results.

Inoculation of the serum into the jugular vein invariably produced the disease, while similar inoculation of the red corpuscles in doses up to 35 cc. did not produce the disease, although there resulted a general reaction represented by an elevation in temperature manifesting itself almost immediately and continuing for about 24 hours. This has been made the basis of a method of active vaccination. Of 16 cows receiving a single injection all but one have remained immune during the period of two months although exposed to natural contagion which caused the disease in the control animals.

While the results are not yet conclusive, the authors feel that the foundation has been made for a successful active immunization against the disease.

Cultivation of the causative organism of epizootic lymphangitis and experimental reproduction of the disease in the horse, A. BOQUET and L. NÈGRE (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 7, pp. 308-311).—The authors, who have succeeded in cultivating *Cryptococcus farciminosus* through the mycelial stage, describe the manner in which this has been accomplished. By inoculating the horse with subcultures they have demonstrated that the cultivated fungus is the cause of epizootic lymphangitis.

The passage of the rabies virus through the ocular conjunctival mucous membrane, L. SANI (*Abs. in Vet. Rec.*, 30 (1917), No. 1524, pp. 119, 120).—The author concludes that it is only possible to produce rabies by the passage of the virus through the ocular conjunctival mucous membrane when the virus used is one of exalted virulence for the species of animal used. "This form of experimental rabies may be produced both in animals with a macroscopically sound mucous membrane and in those with intentionally produced recent and bleeding lesions of the membrane. Positive results from the instillation of rabies virus into the ocular conjunctival sac are, however, rare, and the instillation does not cause rabies when the virus used is not of maximum virulence for the species of animal concerned.

"The rarity of positive results in such experiments should be ascribed to the abundant lachrymation which always follows the instillation of the virus into the ocular conjunctival sac, rather than to a true neutralization of the virus in situ. Nevertheless, a neutralization of virus absorbed in minimal quantities must be admitted, especially in the experiments made with injured mucous membranes, though lesions of the ocular conjunctival mucous membrane are a factor of secondary importance in the genesis of experimental rabies."

Researches in rheumatism, W. LANTZ (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 9, pp. 509-519).—"In some cases of acute articular rheumatism a microorganism can be isolated from the blood. The reason that the positive blood cultures are not found more frequently in acute articular rheumatism is perhaps because the bacteria tend to localize in Aschoff's nodules, and except in very virulent forms of the disease are rapidly destroyed in the circulation. The microorganism isolated resembles a streptococcus. Whether McConkey's bile-salt media can be used as a differential media to exclude streptococci, as claimed by Beattie, must yet be proved, for we know that the streptococcus group is not only a large but a very variable one. The resistance of the isolated microorganism to drying is certainly unique for a nonspore-bearing bacteria, particularly for a streptococcus.

"Acute articular rheumatism, with its frequent complication, pericarditis, has apparently been reproduced in a dog, by an organism isolated from the blood of a patient suffering from a similar disease. The reason why the other animals failed to contract the disease may have been (1) lack of susceptibility on the part of the animal, (2) attenuation of the microorganism, or (3) both factors. Morphologic identification of the microorganism is unreliable, since the diplococcus on some of the media will grow in long chains.

"Further studies are necessary to determine whether acute articular rheumatism is caused by a specific microorganism, particularly immunologic investigations which are under way."

The cause and prevention of hairless pigs, H. WELCH (*Montana Sta. Circ. 71 (1917), pp. 37-47, figs. 9*).—An abstract of Bulletin 119, previously noted (*E. S. R.*, 39, p. 187).

Hog cholera, F. C. MINKLER (*New Jersey Stas. Rpt. 1916, pp. 132-136*).—Conditions prevailing at the station in 1916 seem to prove that the serum simultaneous treatment for hog cholera under average conditions stunts the growth of hogs. The claim that suckling pigs from immune sows carry such immunity during their nursing period was not verified, for losses were recorded among suckling pigs nursing immune sows, although the sows themselves were perfectly healthy.

It is pointed out that if it is desired to establish permanent immunity in a herd where the serum simultaneous method is involved it is absolutely necessary to keep the young suckling pigs free from external infection previous to the serum simultaneous treatment, and that this double treatment should not be instituted until after the pigs weigh at least 50 or 60 lbs. It is also suggested that if it becomes necessary to subject nursing pigs to the double treatment before they have reached the weaning age the treatment should be repeated in six or eight weeks.

The immunity of suckling pigs to hog cholera, C. L. McARTHUR (*Arkansas Sta. Bul. 151 (1918), pp. 3-22*).—This bulletin is a report of experimental work conducted under control conditions to determine whether cholera-immune sows transmit this immunity to their young. Pregnant sows which had not been exposed to the disease were given the Dorset-Niles antihog cholera serum with virus and kept in sheds with concrete floors until after the litters were weaned. In a few instances the serum without the virus was used. The litters were exposed in different ways to hog cholera to test their immunity.

The results of the experiments would indicate that sows actively immunized against hog cholera by the Dorset-Niles method transmit this immunity to their young. A large percentage of the pigs remained immune as long as they were suckling and the sows were immune. When the sow contracted the disease the young pigs did not usually survive more than a few days. There seems to be but little difference in the susceptibility of the pigs by the various methods of exposure, but there was considerable variation in the susceptibility of different pigs of the same litter. As the immunity was found to last only a few weeks after weaning, the author considers it advisable to vaccinate pigs just before or shortly after weaning. Second litters were found as highly immune as the first litters in all cases, and in some cases even more highly immune.

The data was secured from 31 litters, covering a total of 179 pigs, of which 39 succumbed during the course of the experiments. Of these only 15 showed cholera lesions, giving an immunity of 91.7 per cent of the pigs under observation.

Contagious septicemia in swine in Morocco, VELU (*Rec. Méd. Vét., 94 (1918), No. 9, pp. 236-241*).—Clinical observation has shown that there exists among young swine in Morocco a very contagious disease characterized by lesions

somewhat resembling those of septicemia. Bacteriological examination has proved the almost constant presence in the bronchial ganglia of pulmonary lesions and exudates of an ovoid bacterium, which may be considered as a pasteurella. This organism is strongly pathogenic for swine, the source of infection being fecal matter and the path of invasion the digestive and respiratory tracts.

The author emphasizes the importance of the verification of these facts by further study.

Contagious lymphangitis in the horse.—I, New terminology. II, Contribution to the study of the treatment by pyotherapy, BELIN (*Bul. Soc. Cent. Méd. Vét.*, 94 (1918), No. 10, pp. 243-251).—The author proposes a new terminology to differentiate more accurately the various forms of lymphangitis. He suggests that the term epizootic and ulcerous lymphangitis be changed, respectively, to mycotic and bacterial lymphangitis. The mycotic form is subdivided into cryptococcic and sporothricotic, and the bacterial into bacillary, micrococcic, and staphylococcic.

Studies of the different methods of using the pus vaccine, previously noted (E. S. R., 38, p. 587), have led to the conclusion that the best method is to make a series of seven subcutaneous injections, one each day, in a constant dose of 2 cc. If new lesions appear at the end of from 12 to 15 days, a new series of seven injections should be made.

The author discusses also the use of local chemotherapy in the treatment of lymphangitis.

Two new flukes from the dog, M. C. HALL and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 5, pp. 616-626, figs. 7).—In a series of 300 dogs examined post-mortem at Detroit, Mich., 7 were found to contain intestinal flukes. These represented two distinct species new to science, here described as *Alaria americana* and *A. michiganensis*.

A bothriocephalid tapeworm from the dog in North America, with notes on cestode parasites of dogs, M. C. HALL and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 3, pp. 355-362, fig. 1).—Reference is made to a record of *Dibothriocephalus latus* from a dog by Van Es and Schalk (E. S. R., 38, p. 689), followed by a report of the occurrence of another case at Detroit, Mich.

Lesions due to agents used in killing experiment dogs in anthelmintic investigations, M. C. HALL (*Amer. Jour. Vet. Med.*, 13 (1918), No. 8, pp. 383-387).—This is a brief report upon the differentiation of the lesions due to the treatment from the lesions due to disease, accident, or the agent used in killing the experimental animals. It is based upon findings in a study of 300 cases.

Poultry pathology observations, H. R. LEWIS and W. C. THOMPSON (*New Jersey Stat. Rpt.* 1916, pp. 162-168).—This is a discussion of some of the most prevalent and most economically important poultry diseases in New Jersey. These include prolapse of the oviduct, contagious eye roup, tuberculosis, peritonitis, and contagious epithelioma or chicken pox. A suggested treatment for the last disease in its early stages is to remove the scab, paint the wound with iodine, and immerse the head of the hen in a dilute solution of disinfecting material. Observations are also made on the causes and prevention of chick troubles and vices.

Regarding limitations in the interpretation of positive agglutination tests for *Bacterium pullorum* infections, P. [B.] HADLEY (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husband.*, 4 (1918), No. 6, pp. 42-44).—The author states that the agglutination test as ordinarily employed for the detection of *B. pullorum* infection in hens is apparently not fully specific. As the result of investigations on this subject which are being conducted at the Rhode Island Experi-

ment Station, it has been found that blood from birds infected with or immune to *B. pullorum* gives a positive test for bacillary white diarrhea. When the test is performed with *Bacillus typhosus* (human) antigen instead of *B. pullorum* antigen, blood from birds infected with the bacillus of fowl typhoid and related types gives a negative test with *B. typhosus* antigen. It is, therefore, suggested that in routine examinations for *B. pullorum* infection better results may be obtained if human typhoid emulsions are substituted for emulsions of *B. pullorum*.

Fowl pox and roup vaccination (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm.* 43 (1917), pp. 51, 52).—During the course of an outbreak of fowl pox and roup in the college flock of poultry the birds were vaccinated by the Manteufel method. The vaccine was prepared from the exudate and scabs taken from some of the affected birds, and consisted of a suspension of 0.5 gm. of this material pulverized in 100 cc. of physiological salt solution, attenuated at 55° C. for one hour, and filtered. Two vaccines were made, 1 cc. of the suspension being injected subcutaneously.

From the results obtained it is concluded that this method of curing and preventing roup and fowl pox may be effective in some cases, but can not be generally relied upon as the content of the vaccine thus made can not be controlled.

RURAL ENGINEERING.

Irrigation investigations, G. E. P. SMITH and A. L. ENGEE (*Arizona Sta. Rpt.* 1916, pp. 303-310).—Continuing previous work (*E. S. R.*, 35, p. 580), additional data are reported, including run-off measurements and pumping plant tests.

From tests of a 35-horsepower oil engine and a vertical turbine pump at Continental, Ariz., it is concluded that "both the capacity and the fuel economy of oil engines decrease with altitude. The engines built in California should be rated more liberally; they should have some reserve power at an altitude of 2,800 ft. The clearance space should be reduced as the altitude increases.

"Tops fuel oil of 40 to 44° B. gravity can be burned perfectly in well-designed 4-cycle engines and will give more power per gallon than engine distillate (50° B.)."

Composition of the irrigation waters of Utah, J. E. GEEVES and C. T. HURST (*Utah Sta. Bul.* 163 (1918), pp. 43, figs. 11).—Results are reported of 254 analyses of water, including 58 rivers or creeks, the majority of which are used extensively for irrigation purposes; 32 wells, most of which are flowing; 8 springs; 5 reservoirs; and 8 drains.

The composition of the streams varied from 84 to 1,250 parts per million of soluble salts. Thirteen of these contained more than 40 grains per gallon, suggested as the limit by Hilgard. The amount and kind of salt varied with the nature of the drainage basin of the stream, consisting in the headwaters of most streams studied very largely of calcium and magnesium bicarbonate, but being greatly augmented by the influx of saline drainage waters as the stream proceeds downward.

"Some soils are already heavily charged with alkali salts. The waters high in soluble salts must be used with extreme care on such soils. Waters such as the Sevier, Price, Emery, etc., must be used with care on all soils to prevent the accumulation within the soil of the alkali salts.

"Artificial drainage should be applied to tight soils already charged with alkali before highly saline waters are applied. Where possible use should be made of the high waters to flush out the soils as these waters are usually

fresher than the same stream later in the season. Moreover, some streams may be used with impunity during the early part of the season, while later they become so heavily charged with soluble salts that they are very likely to do damage.

"Cultural methods and surface tillage should be practiced wherever possible to prevent the concentration of soluble salts at the surface.

"The composition of the well waters ranged from 24,400 to 120 parts per million. Eleven of these contained more than 40 grains per gallon.

"The composition of the springs ranged from 4,800 parts per million with only 10 per cent of the total nontoxic bicarbonates to 150 parts per million with 63 per cent of it nontoxic carbonates.

"In only two of the reservoirs examined were there excessive quantities of soluble salts. . . . Two of the drains examined contained large quantities of soluble salts, but the others did not contain greater quantities than are found in a number of the irrigation waters."

The efficient operation of thrashing machines, H. R. TOLLEY (*U. S. Dept. Agr., Farmers' Bul. 991 (1918), pp. 15*).—The purpose of this publication is stated as to point out some of the fundamental factors in successful thrashing and offer some suggestions which will enable thrashermen to keep their machines at their highest efficiency.

Report on the water supply in the cranberry bogs of New Jersey, F. O. CHURCH (*New Jersey Stas. Rpt. 1916, pp. 343-366, pl. 1, figs. 6*).—A general report, based in part on a questionnaire sent out to growers in the State.

The two principal sources of water supply of the bogs in southern New Jersey are the numerous small streams and the extensive cedar swamps. Prevailing practices are described, and suggestions made for the construction and maintenance of embankments, gates, and trunks. Experimental work started at Whitesbog, N. J., to study the ground water conditions on cranberry bogs and the optimum elevation of the water table is also briefly noted.

[Water analyses], A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1916, pp. 297, 298, 300, 301, 302*).—An analysis of Salton Sea water June 10, 1916, showed an increase in concentration since June 8, 1915, from 1,377 to 1,647 parts per 100,000 of total solids. Attention is called to the fact that phosphoric acid, obtainable in analyses in the earlier years, has now been reduced to a doubtful trace.

Analyses of water from the Temple drainage ditch, showing an improvement in its character which promises well for its eventual use for irrigation purposes, and of a well water, in which the upper scanty flow is suitable for domestic use and the lower abundant flow is an excellent hard irrigating water, are also reported.

Surface water supply of Pacific slope basins in Washington and upper Columbia River Basin, 1915 (*U. S. Geol. Survey, Water-Supply Paper 412 (1918), pp. 258+XLIX, pls. 2*).—This report contains the results of measurements of flow made on the Quinault River and Puget Sound basins in Washington and the upper Columbia River Basin during 1915, together with miscellaneous discharge measurements in Washington and the usual lists of stream-gauging stations and publications.

Typical specifications for nonbituminous road materials, P. HUBBARD and F. H. JACKSON, JR. (*U. S. Dept. Agr. Bul. 704 (1918), pp. 40, figs. 3*).—This publication supplements Bulletin 691 (E. S. R., 39, p. 591), giving a number of typical specifications for the more common nonbituminous materials used in the construction and maintenance of various types of highways. Two appendixes describe, respectively, methods of testing materials and methods of selecting and shipping samples.

Highway cost keeping, J. J. TOBIN and A. R. LOSH (*U. S. Dept. Agr. Bul. 660 (1918), pp. 52, figs. 9*).—The purpose of this publication is to present, first, in an elementary way the principles which govern cost keeping in general; second, a practicable application of those principles to highway work. The method of classification of expenditures is described, and codes for use in the various operations are given, together with suggested standard cost-recording forms and definitions of operation terms. An appendix presents several tables useful in determining costs and preparing estimates, including a schedule of rental rates for various items of equipment used during the season of 1917.

Labor-saving practices in haymaking, H. B. McCCLURE (*U. S. Dept. Agr. Farmers' Bul. 987 (1918), pp. 20, figs. 33*).—The author indicates, mostly by illustrations with brief explanations, time and labor saving methods in haying operations, with respect to the use of both improved machinery and a more efficient utilization of available horse and man labor.

The use of machinery in cutting corn, H. R. TOLLEY (*U. S. Dept. Agr., Farmers' Bul. 992 (1918), pp. 16, figs. 6*).—This publication discusses the corn binder and the platform harvester, and points out the conditions under which they may be used to the best advantage, as well as the disadvantages of their use.

Daylight culling of poultry, G. R. SHOUP (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 5, pp. 72-75, figs. 3*).—This article describes and illustrates a poultry-catching net and a catching and sorting crate for use by daylight in transferring poultry from brooder to laying house or from one house to another and in culling young pullets and cockerels. It is pointed out that this work can be done to the best advantage by daylight.

Poultry houses, W. F. SCHOPPE (*Montana Sta. Circ. 72 (1917), pp. 49-69, figs. 11*).—The general principles as to poultry housing are discussed, and detailed descriptions with bills of material, etc., given of the Maine curtain-front house (*E. S. R., 21, p. 274*) and the shed-roof house in use at the station.

It is concluded that "for Montana conditions a wide house is preferable to a narrow one, since it places the roosts farther from the openings in the front, and the birds are less affected by outside changes in temperature. It is advisable to sheath houses on the inside to give extra protection during extremely cold weather, and sheath them overhead in order to cut down the air space as much as possible.

"The combination curtain- and glass-front house has proved extremely satisfactory in many sections of the State. It provides good ventilation, abundance of sunshine, does not allow a draft to strike directly on the birds, and is to be preferred to the open-front house, which has no glass in the front."

A successful Iowa shed-roof poultry house, G. M. TURPIN and M. F. P. COSTELLOE (*Iowa Sta. Bul. 176 (1918), pp. 175-184, figs. 6*).—A poultry house devised by the station for housing 75 or more laying hens under Iowa conditions is described. This house is built with hollow tile walls, shed roof, and cement floor. Construction details and a bill of materials are included.

RURAL ECONOMICS.

Rural problems of today, E. R. GROVES (*New York: Association Press, 1918, pp. IX+181*).—The author shows that rural life is entering upon a period of flux which heretofore has been characteristic of the cities. He discusses the socializing factors of the rural community (the school, the church, the home, the newspaper, and secret societies), comparing them with their influence on urban life. He suggests that the effects of a lack of mental stimuli of rural environment may be counteracted through an enlargement of the services of the church and a change in the activities of the school.

Profitable management of general farms in the Willamette Valley, Oreg., B. HUNTER and S. O. JAYNE (*U. S. Dept. Agr. Bul. 705 (1918), pp. 24, figs. 5*).—The information in this bulletin was secured from an analysis of the business of 212 farms in two counties of Oregon in 1912 and from a study of general farm practice in the Willamette Valley covering a period of several years. Sixty-eight farms studied are located on clay soil and 144 on silt loam soil.

The bulletin shows that the silt loam type of farming was the more general and diversified, hay, potatoes, and clover seed being important supplements to oats and wheat, and only 2.7 per cent of the land in rotation lying fallow each year. These farms were 50 per cent more profitable than the clay farms, which had a greater acreage and lower yield of oats and a much larger percentage of the rotation area lying idle as summer fallow. Comparative yields and values of the cereal crops per acre indicate that the area devoted to oats on both clay and silt loam farms should be reduced, and more of the tillable land should be developed to clover and other legumes.

The investigators find that some of the factors which tend to efficiency are the area of land in summer fallow, the income per productive animal unit crop yields, and the percentage of the field crop area devoted to clover and other legumes. Tables are given to represent the relation of rotation area, live stock, and sources of income to the type of farming.

A little farm well tilled, R. H. FORBES (*Arizona Sta., Timely Hints for Farmers, No. 133 (1918), pp. 8, figs. 2*).—The author describes the management of a farm of 18.91 acres, in which alfalfa and cotton were the principal crops and sheep were kept to clean weeds from the ditches. He indicates the methods of handling the crops and offers suggestions for improvement.

Report of the women's mission to French farms in February, 1916 (*Reading, Eng.: Berkshire Committee Women and Farm Labor [1916], pp. 20, figs. 8*).—This is the report of a committee of British women who investigated French agricultural conditions within the limits of the military zone in February, 1916. Following the report are notes regarding individual farms visited.

Better use of man labor on the farm, H. R. TOLLEY and A. P. YERKES (*U. S. Dept. Agr., Farmers' Bul. 989 (1918), pp. 15, figs. 22*).—This contains illustrations of methods that may be used in increasing the efficiency of farm labor through the proper use of horse labor and machinery.

Housing the employees of California's citrus ranches, A. D. SHAMEL (*Cal. Citrogr., 3 (1918), Nos. 4, pp. 70, 71, figs. 4; 5, pp. 96, 97, figs. 5; 7, pp. 150, 151, figs. 8*).—These three articles describe the methods of housing employees used successfully during the last ten years on three citrus ranches in southern California.

The Mexicans and the Japanese are housed in separate groups. There are dormitories for the unmarried and two and three-room cottages for the married groups. On some ranches these houses are provided either rent free or at a very low rent (2½ to 4 per cent of the initial cost).

Small plats of ground are furnished each employee for a garden or for personal use. On one ranch each Mexican laborer is allotted 100 by 110 ft. of land, and free water is piped to the lot. He builds his own house and owns an equity in it as long as he remains on the ranch. If he lacks money to buy lumber, the manager of the ranch advances it and makes small deductions from the monthly wages. Such satisfactory arrangements are made that employees are contented and have a feeling of permanence which tends to prevent them from being attracted by other forms of employment.

Organization as an aid for meeting the war situation, G. H. POWELL (*West. N. Y. Hort. Soc. Proc., 63 (1918), pp. 27-34*).—The author maintains that if individuals are organized into strong local branches and federated into larger

central units, an enormous economic waste in farm products can be eliminated. By producers' organizations, farm products can be standardized, assembled in large quantities, graded, packed, and distributed systematically in accordance with the needs of the various markets. Losses which frequently amount to 10, 15, or 20 per cent of the total production can thereby be reduced to a minimum.

Though agricultural labor itself is not organized, it is so connected by the law of supply and demand with labor that is organized that the individual producer is practically helpless. He must, therefore, meet organization with organization.

Report of the Irish Agricultural Organization Society, Ltd. (*Rpt. Irish Agr. Organ. Soc.*, 1917, pp. 133).—This report continues the information previously noted (*E. S. R.*, 38, p. 90) by adding data for the year ended March 31, 1917.

Farm mortgage loans in general and their relation to the Federal farm loan system, J. B. MORMAN (*West. N. Y. Hort. Soc. Proc.*, 63 (1918), pp. 12-18).—This is an address explaining the ruling of the Federal Farm Loan Board regarding loans on orchard property, as well as the general procedure in obtaining loans under the system.

The land bank of the State of New York, J. J. DILLON (*New York: The Rural New Yorker* [1918], pp. 12).—This is an explanation of the workings of the system developed in New York State to finance real estate loans for long terms.

Michigan (*Lansing, Mich.: Pub. Domain Com. and Immigr. Com.*, 1918, pp. 52, figs. 46).—This is a partial reprint or synopsis of a former immigration publication of the same title, setting forth the agricultural, horticultural, and industrial advantages of the State and indicating the opportunities and future possibilities for settlers.

Montana (*Helena: Dept. Agr. and Publicity*, 1917, pp. 140, pls. 2, figs. 63).—This bulletin aims to give information of interest to prospective settlers. Among other things it tells something of the agricultural, live stock, dairying, horticultural, transportation, mercantile, and other industries of Montana, and gives information in regard to climate and educational facilities.

Government crop reports (*U. S. Dept. Agr., Bur. Crop Estimates Circ.* 17, rev. (1918), pp. 19, fig. 1).—This circular continues the discussion of sources of information, methods of preparation and checking, and demonstrated accuracy of crop reports, previously noted (*E. S. R.*, 32, p. 689).

Monthly Crop Report (*U. S. Dept. Agr., Mo. Crop Rpt.*, 4 (1918), No. 8, pp. 85-100, fig. 1).—This number contains a crop summary for August 1, 1918; the usual data with reference to acreage and condition of the principal farm crops on August 1, 1918, with comparisons; estimated farm value of important products July 15 and August 1; average prices received by producers, and the range of prices of agricultural products at important markets. It also contains data as to the live stock on farms of crop reporters July 1, 1918 and July 1, 1917; forecasts from the condition of beans, Kafir corn, broom corn, and hops; commercial stocks of farm products July 1, 1918; special commercial apple report, August 1918; a definition of "normal conditions"; pasture land area; record potato yield per acre; Sea Island and Egyptian cotton acreage; forecast of spring wheat varieties; sugar consumption on farms in Wisconsin; acreage of sugar cane, 1918; truck-crop notes; special regional report; Louisiana sugar report; live stock statistics—relative number July 1, 1916, and receipts in July; method of obtaining index number of prices; funds to aid needy western farmers; and temperature and precipitation statistics.

Third national census (*Tercer Censo Nac. [Argentina]*, 6 (1914), pp. LIX+741, pls. 20).—This volume comprises statistics showing the number and value of cattle, horses, sheep, pigs, goats, ostriches, and domestic fowls in Argentina,

with comparative tables of changes since 1888. The statistics are given according to territorial divisions and other subdivisions.

The Chicago Produce Market, E. G. NOURSE (*Diss., Univ. Chicago, 1918, pp. 10+304, pls. 3, fig. 1*).—The author here details the methods used by the Chicago Produce Market in distributing annually alone \$300,000,000 worth of produce among the 3,000,000 people of Chicago. He discusses (1) the wholesale market as to its location, organization, and transportation and storage facilities; (2) the retail market; and (3) several projects for improving the market system. He advises the reorganization of the wholesale trade, and the curtailment of needless expense to retailers through chain stores, consumers' cooperation, public markets, and dealers' cooperative buying. He maintains that the complete elimination of the middleman is not practical, in so far as he organizes a demand for the various sorts of produce and brings it into effective touch with the producer who is in no position to find it for himself.

The Rotterdam cereal market, V. VAN PESKI and D. L. UYTENBOOGAART (*Le Marché des Céréales de Rotterdam. Rome: Inst. Internat. Agr., Serv. Statist. Gén., 1918, pp. 83, pls. 10*).—This study includes the period 1904 to 1913, inclusive and comprises general information concerning port facilities, causes of fluctuations in the movement of exports and imports, exchange, and long time credit. It includes statistics concerning all cereals arriving at Rotterdam and transported to other destinations, and graphs showing the movement of freight from Rotterdam to the principal commercial centers of the Netherlands.

AGRICULTURAL EDUCATION.

A study of organization and method of the course of study in agriculture in secondary schools, T. H. EATON (*Teachers Col. Columbia Univ. Contrib. Ed., No. 86 (1917), pp. [4]+183*).—This is a study of the aims, equipment, teachers and their salaries, enrollment, age of pupils, entrance requirements, course of study, methods, extension work, correlation, adjustments to seasonal requirements, local demands, etc.; and a discussion of the general applications.

Some indication is given of the ways in which schools have sought to adjust their means to the ends of agricultural education. There is found to be some measure of agreement with regard to what shall be taught and how it shall be taught, particularly the first. "That which shall be taught is the more or less formally organized content of science with respect to production handed down by the agricultural colleges, along with the more fully standardized content of academic subjects selected by the high schools under college dominance. That content shall be taught in part, at least, through the use of textbooks and lectures, and the question and answer recitation method of the high school. Yet the variation in attempts at organization and modification of method in the contact of teacher and pupil reveal the fact that the solution is by no means 'standardized' for the agricultural course, and that active intelligence on the part of teachers and supervising bodies is at work to the determination of closer adjustments to the needs of pupil and community." The economic aspects of rural life, rather than the diversified activities of rural society as unified in the farmer, have served to the determination of aim, to which fact is ascribed in no small measure the success of the agricultural course.

Any arbitrary standards as to what proportion of subjects in the course for the farm boy should bear upon production are deemed likely to prove futile. The allotment of one-half of the course to such subjects is not thought excessive in the vocational schools, though no measure of results is available for deter-

mination, the teacher and the pupil being the determining factors at present. The minimum of four units in vocational agriculture seems to prevail, with a trend to increase in the allotment.

The author considers it unfortunate that the tendency exists toward standardization of a course of study for farm boys along lines made familiar by the college entrance requirements and other "soporific" influences and thinks that the working out of an organization and method correlated to an aim based on the needs of the individual in a rural community, if successfully done, may suffice for the breaking of the crust of tradition. He finds that those in charge of the work of secondary agricultural education under grants of State aid seem generally alive to the fact that successful adjustment of school means is to come through trial and rejection by teachers in the field.

According to the author good organization and method in the secondary school teaching agriculture consist (1) in the selection of problems according to social factors of local demand, demands of progress, type representation, and continuity of expansion; physical factors of local opportunity and seasonal determination; and psychological factors of immediate activity and apperceptive basis in the pupil in terms of native interests, age, farm, village, or urban experience, school experience, and present life in the community, the home, the school, or on the farm; (2) the selection of the teacher in terms of farm experience, technological training in agriculture, teaching experience, pedagogical training, and personality; and (3) the selection of equipment in terms of simplest adaptation to the problem. Appendixes contain statistical data showing the extent of the movement to teach agriculture in secondary schools and exhibits of lessons.

The data used in this study were gathered by personal visits to 50 schools in 15 States during the fall and winter of 1915-16, correspondence with State departments of education and university and agricultural college departments of education, personal conferences with agricultural educators, and through catalogues. The schools visited have been divided into three type groups, viz. (1) the public high school, including city, town or district, and county high schools, approved academies, congressional district schools, and junior high schools; (2) special State, county, and philanthropic agricultural schools; and (3) one private preparatory school. To make clear this classification a description is given of one school in each of the special groups.

How teachers of agriculture are trained in the United States, C. D. JARVIS (*Agr. Gaz. Canada*, 5 (1918), No. 6, pp. 622-624).—The author discusses briefly the beginning of agricultural education in the United States as a Federal enterprise, the scarcity of efficient teachers, congressional legislation, the present status of teacher training, requirements for graduation, and general requirements.

Summer schools for teachers (*Agr. Gaz. Canada*, 5 (1918), No. 6, pp. 595-598).—Brief statements, by agricultural education officials, are given of the present status of the summer school work for teachers of agriculture and home economics in the Provinces of New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, British Columbia, and Alberta.

Teaching of agriculture in the schools of the Maritime Provinces, J. W. MITCHELL (*Agr. Gaz. Canada*, 5 (1918), No. 2, pp. 122-124).—A brief account of the efforts being made to teach agriculture in the schools of Nova Scotia, New Brunswick, and Prince Edward Island.

MISCELLANEOUS.

Twenty-seventh Annual Report of Arizona Station, 1916 (*Arizona Sta. Rpt.* 1916, pp. 233-320, figs. 5).—This contains the organization list, an adminis-

trative report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1916, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. A brief report on the work and expenditures of the college of agriculture is appended.

Forty-first Annual Report of Connecticut State Station, 1917 (*Connecticut State Sta. Bul.* 206 (1918), pp. XVI).—This contains the organization list, a report of the board of control, and a financial statement for the fiscal year ended September 30, 1917.

Annual Report of New Jersey Stations, 1916 (*New Jersey Stas. Rpt.* 1916, pp. XXVIII+625, pls. 34, figs. 32).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1916, and for the College Station for the fiscal year ended June 30, 1916, a report by the director (E. S. R., 36, p. 898), and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. Reports of the fertilizer inspections have been noted in Bulletins 297 (E. S. R., 36, p. 429) and 303 (E. S. R., 37, p. 219), feeding stuffs in Bulletin 295 (E. S. R., 36, p. 167), insecticides in Bulletin 301 (E. S. R., 37, p. 243), and seeds in Bulletin 302 (E. S. R., 37, p. 239). A report of the division of extension in agriculture and home economics (pp. 249-297) is also included.

County experiment farms in Ohio.—Annual Reports for 1916 and 1917 (*Ohio Sta. Bul.* 323 (1918), pp. 241-486, figs. 29).—This bulletin comprises a brief prefatory account by C. W. Montgomery on The Work of the County Experiment Farm; an appendix summarizing the experiments on the various farms with fertilizers and varieties of cereals and soy beans; and nine parts, also issued as separates, as follows: Part 1, The Miami County Experiment Farm, Sixth and Seventh Reports, for 1916 and 1917; part 2, Paulding County Experiment Farm, Sixth and Seventh Annual Reports, for 1916 and 1917; part 3, The Clermont County Experiment Farm, Fifth and Sixth Annual Reports, for 1916 and 1917; part 4, The Hamilton County Experiment Farm, Fifth and Sixth Annual Reports, for 1916 and 1917; part 5, The Washington County Experiment Farm, Third and Fourth Annual Reports for the Years 1916 and 1917; part 6, The Trumbull County Experiment Farm, Second and Third Annual Reports, for 1916 and 1917; part 7, The Mahoning County Experiment Farm, Second and Third Annual Reports, for 1916 and 1917; part 8, The Belmont County Experiment Farm, First Annual Report, for 1917; and part 9, The Madison County Experiment Farm, First Annual Report, for 1917, this including a biographical account of the late Miss Adah Bertha Coover, donor of the Madison County farm. The experimental work recorded in the bulletin is for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 8, pp. 227-257, figs. 10).—This contains several articles abstracted elsewhere in this issue and several miscellaneous notes.

Monthly Bulletin of the Western Washington Substation (*Washington Sta., West Wash. Sta. Mo. Bul.*, 6 (1918), No. 5, pp. 61-76, figs. 3).—This contains brief articles on the following subjects: The Dairymen's Problem, by W. A. Linklater; Investigation of the Cost of Milk Production in Western Washington, by F. W. Rader (see p. 784); The War and Agriculture, by F. O. Kreager; Bitter Flavor in Milk, Associated with Difficult Churning of the Cream, by E. G. Woodward; Daylight Culling of Poultry, by G. R. Shoup (see p. 794); and Fall Seeding, by E. B. Stookey.

NOTES.

Georgia Station.—H. P. Stuckey, horticulturist of the station since 1908, has been appointed director, succeeding J. D. Price, who has been appointed to the State railroad commission. Other appointments include T. E. Keitt as chemist, J. A. McClintock as botanist and plant pathologist, and H. E. Shiver as assistant chemist, effective Nov. 15, Dec. 1, and Dec. 27, 1918, respectively.

Weekly news letters or press bulletins prepared by members of the staff are now being sent regularly to newspapers of the State. It is reported that this service is being much appreciated.

Officers and Committees for 1919 of the Association of American Agricultural Colleges and Experiment Stations.—The complete list of general officers elected at the Baltimore meeting as noted on page 810 is as follows: President, President C. A. Lory of Colorado; vice presidents, President Brown Ayres of Tennessee, Directors A. M. Soule of Georgia, J. G. Lipman of New Jersey, President A. F. Woods of Maryland, and Director R. W. Thatcher of Minnesota; secretary-treasurer, Dean J. L. Hills of Vermont; bibliographer, Dr. A. C. True of the States Relations Service, and members of the executive committee, Presidents W. O. Thompson of Ohio, R. A. Pearson of Iowa, and W. M. Riggs of South Carolina, Director W. H. Jordan of New York, and Dean H. L. Russell of Wisconsin.

For the various sections the officers are as follows: College work and administration, chairman, President E. C. Perisho of South Dakota, and secretary, President R. D. Hetzel of New Hampshire; engineering division, chairman, President W. M. Riggs of South Carolina, and secretary, Dean A. A. Potter of Kansas; and home economics division, chairman, Miss Agnes Harris of Florida, and secretary, Miss Inga M. K. Allison of Colorado. Experiment station work: Chairman, Director J. C. Kendall of New Hampshire; secretary, Director C. G. Woodbury of Indiana; and recording secretary, W. H. Beal of the States Relations Service. Extension work: Chairman, Director C. S. Wheeler of Ohio; secretary, Director B. W. Kilgore of North Carolina; and recording secretary, Mr. Bradford Knapp of the States Relations Service.

The membership of the committee on instruction in agriculture, home economics, and mechanic arts was enlarged to represent the additional branches of subject matter and reorganized as follows: For agriculture, Director J. F. Dugger of Alabama for three years, Dr. A. C. True of the States Relations Service and Dean T. F. Hunt of California for two years, and Professor G. A. Works of Cornell University for one year; for home economics, Miss Edna N. White of Ohio, Miss Agnes Harris of Florida, and Miss Anna Richardson of the Federal Board of Vocational Education, for terms of three years, two years, and one year, respectively; and for engineering, President W. M. Riggs of South Carolina, Dean A. A. Potter of Kansas, and Professor H. W. Tyler of Massachusetts, for three-year, two-year, and one-year terms.

Two vacancies on the committee on extension organization and policy were filled by appointment for three years of Directors L. A. Clinton of New Jersey and W. W. Long of South Carolina. On the joint committee on the publication of research Dr. W. A. Riley of Minnesota succeeded Dean E. M. Freeman. The remaining personnel of the standing committees was continued unchanged.

EXPERIMENT STATION RECORD.

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ABSTRACT NUMBER.

No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Studies on proteins (*Compt. Rend. Lab. Carlsberg*, 12 (1917), pp. IV+372, pls. 2, figs. 32).—This volume contains the results of extensive researches based as far as possible upon exact quantitative chemical and physical measurements of a single well-defined protein, hen's egg albumin. Five papers are presented:

I. *On the preparation of egg albumin solutions of well-defined composition and on the analytical methods used*, S. P. L. Sørensen and Margrethe Höyrup (pp. 12-67).—This paper gives a description of the method used in the preparation of the experimental material and of the tests for purity and the control-researches made in order to prove the fitness for use of the method employed. Further, the analytical methods used are described, together with the corresponding control determinations.

II. *On the capacity of egg albumin to combine with acids or bases*, S. P. L. Sørensen et al. (pp. 68-163).—This treats of the question as to the capacity of the egg albumin to combine with acids or bases, especially the capacity to combine with sulphuric acid in the presence of different concentrations of ammonium sulphate.

III. *On the composition and properties of egg albumin separated in crystalline form by means of ammonium sulphate*, S. P. L. Sørensen and Margrethe Höyrup (pp. 164-212).—This paper discusses the crystallization of the egg albumin when ammonium sulphate is added, and gives a contribution toward the elucidation both of the crystallization process itself and of the question as to composition of the crystals separated.

IV. *On the state of equilibrium between crystallized egg albumin and surrounding mother liquor and on the applicability of Gibbs' phase rule to such systems*, S. P. L. Sørensen and Margrethe Höyrup (pp. 213-261).—This article relates to the equilibrium between the egg albumin crystallized out and the surrounding mother liquor.

V. *On the osmotic pressure of egg albumin solutions*, S. P. L. Sørensen et al. (pp. 262-372).—This paper deals with the question as to the osmotic pressure of egg albumin solutions and its dependence on the composition of the solution.

The preparation of pure casein, L. L. VAN SLYKE and J. C. BAKER (*Jour. Biol. Chem.*, 35 (1918), No. 1, pp. 127-136, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 19, pp. 1982, 1983).—The authors at the New York State Experiment Station have devised a method of preparing pure casein which consists essentially of treating undiluted milk with normal acid, preferably lactic or a mixture of one part hydrochloric and two parts acetic acid. The acid is introduced slowly into the undiluted milk below the surface, the tip of the tube carrying the acid into the

milk being so arranged that it is very close to a mechanical stirrer revolving at a high speed and also near the bottom of the vessel containing the milk. By this means the acid does not cause coagulation of the casein at the point where it first comes into contact with a portion of the milk. The coagulum of casein is separated by centrifuging the mixture. It is then purified by centrifuging several times with water, twice with alcohol, and three times with ether.

By this method casein can be prepared within 10 hours. It is said to contain neither inorganic phosphorus nor calcium and to dissolve at once in dilute solutions of monobasic alkalis and also in excess of limewater to a clear solution. The yield is practically quantitative.

The occurrence of melezitose in a manna from the Douglas fir, C. S. HUNSON and S. F. SHERWOOD (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 9, pp. 1456-1460).—A sample of Douglas fir manna was found to yield about 50 per cent of pure crystalline melezitose. The manna also contained sucrose and some reducing sugar, probably a mixture of glucose with a smaller quantity of fructose. The dry manna had the following approximate percentage composition: Melezitose from 75 to 83, sucrose 2.9, and reducing sugars 11.5.

A sample of tarandjabine, a manna which forms on a shrub or small tree (*Athagi camelorum*) in Persia, was examined and found to contain melezitose but in smaller amounts than the Douglas fir. A suggested explanation of the occurrence of this manna is that the bees collect it and store it in the form of honeydew honey.

The effect of frost and decay upon the starch in potatoes, H. A. EDSON (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 9, pp. 725, 726).—The author suggests the possibility of using frosted and decayed potatoes as a source of starch. Examination of such potatoes has shown them to be capable of producing acceptable and frequently normal yields of clean, white starch of good quality. The mechanical difficulties in the recovery of starch from decayed pulp were found to be sometimes greater and sometimes less than from normal pulp, but it is considered entirely feasible to apply the usual methods in the production of sizing starch in factories at the large shipping centers and thereby to utilize the great quantities of frozen and decayed potatoes arriving during the fall and winter.

New oil seeds from Sierra Leone, W. R. DUNSTAN (*Bul. Imp. Inst. [So. Kensington]*, 16 (1918), No. 1, pp. 35-40).—Descriptions and analyses are given of several new or little-known oil seeds and oils from Sierra Leone, including the kernels of *Pentadesma butyracea*, piassava nut oil, and "Po-yoak" nuts and oil.

Two plant products from Colombia, A. L. BACHARACH (*Analyst*, 43 (1918), No. 509, pp. 289-291; *abs. in Jour. Soc. Chem. Indus.*, 37 (1918), No. 18, p. 553A).—The following analyses are reported of the oil of *Jessenia polycarpa*, obtained from the nuts of the "sejen" or "unamo" palm, and of the seeds and oil of *Caryodendron orinocense*:

Composition of the oil of *J. polycarpa*: Specific gravity ($\frac{15^{\circ}}{4^{\circ}}\text{C.}$), 0.9161; refractive index, 1.4682; saponification value, 188.5; free fatty acids (as oleic acid), 1.9; iodine value (Wijs), 74.1; Hehner value, 93.8; molecular weight of insoluble fatty acids, 273; and iodine value (Wijs) of free fatty acids, 79.5. These constants, with the exception of the iodine value, closely resemble those of olive oil. The oil is used by the natives of the llanos of San Martin for culinary purposes.

Percentage composition of the husked kernels of seeds of *C. orinocense*: Water, 4.43; ash, 2.95; crude fiber, 2.4; oil (ether soluble), 53.3; proteins, 12.9; and other nitrogen-free products (by difference), 24.

Oil obtained from seeds of *C. orinocense*: Specific gravity ($\frac{15^{\circ}}{4^{\circ}}$), 0.922; refractive index, 1.4744; saponification value, 188.1; free fatty acids (as oleic acid), 15.8; iodine value (Wijs), 108.5; and Hehner value, 94.4.

The roasted seeds are said to have a taste not unlike that of burnt almonds.

An agricultural source of benzoic acid, P. J. MOLONEY and F. T. SHURT (*Canad. Chem. Jour.*, 2 (1918), No. 9, pp. 233, 234).—The ordinary methods of preparing benzoic acid from cow's urine are outlined, and a new method is described which depends upon the decreased solubility of the acid in cooled solutions. In the case of purified urine milk of lime is first added to clarify the liquid. The supernatant liquid is then poured or siphoned off, and the benzoic acid readily separates out on acidifying and cooling to 0° C. If the urine is fresh, hippuric acid is obtained which may then be hydrolyzed to obtain the benzoic acid.

The method is said to be as efficient as evaporating the fresh urine to one-half its original volume and precipitating the hippuric acid at room temperature, and is thought to be of practical application on dairy farms equipped with barns having concrete gutters which would make possible the collection of the urine.

Studies on pollen and pollen disease.—I, The chemical composition of ragweed pollen, JESSIE H. KOESSLER (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 415-424).—The following percentage composition of the ragweed pollen is reported: Moisture 10.5, ash 10.6, total reducing sugars after hydrolysis 6.89, ether-soluble lipoids 10.3, fatty acid after hydrolysis 4.75, phytosterol (Windaus method) 0.34, insoluble in ether but soluble in 95 per cent alcohol 12.5, extractives, etc., soluble in alcohol (resins) and water 11.5, and insoluble residue (crude fiber, proteins, etc.) 37.71. Tables are given of the hydrolysis products of the pollen and of the distribution of nitrogen, phosphorus, and sulphur in the moist pollen.

The results of the protein hydrolysis of the ether-alcohol-extracted pollen show a relatively large amount of arginin and histidin nitrogen, and indicate that these and probably all of the nitrogen are present in the pollen in protein combination.

The active constituent of the thyroid, E. C. KENDALL (*Jour. Amer. Med. Assoc.*, 71 (1918), No. 11, pp. 871-873, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 22, p. 2359).—Further details are given in regard to the nature of the active constituent of the thyroid (*E. S. R.*, 37, p. 65) and the chemical groups that are responsible for its physiologic activity. The substance which has been isolated in pure crystalline form has been named, on account of an oxy-indol grouping, thyro-oxy-indol, or thyroxin. Its activity has been shown to be due to the CO-NH groups of the indol ring, which in the body open to form COOH NH₂. Attention is called to the fact that the open and closed forms of thyroxin bear to each other the same relation as does creatin to creatinin or as amino acids to the form in which they are united in protein.

"In regard to the relation of iodine to the activity of thyroxin, the presence of iodine in the compound must exert some influence, and it seems not improbable that the presence of iodine renders the active groups more reactive. In the absence of iodine it would take a greater working pressure to bring about the reaction."

Reagents and reactions, E. TOGNOLI (*London: J. and A. Churchill, 1918, pp. VIII+228*).—This book was translated by C. A. Mitchell, who has added a number of reactions not given in the Italian edition. The material includes tests of purity of the more important reagents; reactions classed under the names of the chemists who first applied them; test papers for acids and bases, for special

reactions, and for clinical tests; a collective index of reagents and reactions of different substances; and specific gravity tables.

On indicators in animal tissues, W. J. CROZIER (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 455-460).—This article supplements the study previously noted (E. S. R., 35, p. 204). The characteristics are given of a number of pigment substances from various marine invertebrates which exhibit reversible acid-alkali color changes. The hydrogen-ion concentrations at the point of color change are recorded in tabular form. These findings are compared with the colors of the living tissues in an attempt to determine the reactions of the cells concerned under different conditions.

A new form of ultra-filter: Some of its uses in biological and synthetic organic chemistry, P. A. KOBER (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 8, pp. 1226-1230, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 22, p. 2261).—Two forms of ultra-filters, one a simple laboratory arrangement and the other adapted to the filtration of large amounts of substances, are described with illustrative diagrams. The principle of the apparatus is that of pervaporation (E. S. R., 37, p. 409) of both the dialysate and the diffusate solutions during dialysis.

Suggested uses of ultra-filtration in biological and synthetic organic chemistry are the removal of coloring matter, humus, and colloids in general. The advantages of this method of removing coloring matter are said to be that it requires no attention when once the process is started, it concentrates both residue and filtrate, and it can be conducted at a low temperature so that even very sensitive substances can be safely treated.

A still for the continuous preparation in quantity of water of high purity, H. W. MOSELEY and R. G. MYERS (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 9, pp. 1409-1411, fig. 1).—The apparatus consists essentially of two 5-liter Pyrex glass bulbs set at an angle of about 60°. The first is equipped with a pressure tube, raw distilled water supply, and delivery tubes, and the second with inlet tube and exit column, the latter so arranged that any water or impurities mechanically carried over can not enter the condenser. In the first bulb a 10 per cent potassium dichromate solution in 5 per cent sulphuric acid is used and in the second a solution of barium hydroxid.

The features of the apparatus which are pointed out as departures from the ordinary form are (1) the use of Portland cement stoppers which are molded to fit the flask and made to fit tightly by means of asbestos cord, (2) the modified adapter which automatically adjusts the drip water, and (3) the complete elimination of all rubber and cork parts from the apparatus.

Carbonation studies.—II, The carbonation of distilled water, H. E. PATTEN and G. H. MAINS (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 4, pp. 279-288, figs. 3).—In continuation of carbonation studies at the Bureau of Chemistry, U. S. Department of Agriculture (E. S. R., 37, p. 716), experiments are reported on the carbonation of distilled water under different conditions. The effect of various factors on the carbonation process and on the gas content of an efficiently carbonated water is summarized in detail.

Detection of rape oil, H. KREIS and E. ROTH (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gesundheitsamt.*, 6 (1915), No. 1, pp. 38-40).—A method of detecting the presence of rape oil in olive oil is described, which consists essentially of the determination of the fractional melting points of the fatty acids obtained by the action of hydrochloric acid on the lead salts successively precipitated from alcoholic solutions of the acids. The differences in the fractional melting points are much greater in rape oil than in pure olive oil. Tables are given of the fractional melting points for pure rape oil, olive oil, and definite mixtures of the two.

The Crismer test for the detection of foreign fat in butter, lard, etc., A. W. STEWART (*Jour. State Med.*, 26 (1918), No. 10, pp. 312-315).—The irregularities in the results obtained in the Valenta test are considered by the author to be due in part to variations in strength of the glacial acetic acid. See also a previous note by Fryer and Weston (*E. S. R.*, 39, p. 110). As a substitute method, a modification of the Crismer method of heating the fat and alcohol in a sealed tube in sulphuric acid is described. The procedure is similar to that of the Valenta test.

Three cc. each of melted filtered fat and absolute alcohol are pipetted into a test tube and heated over a small flame with continuous stirring until the turbidity reappears. The temperature at which this occurs is known as the Crismer number. It is considered advisable to combine this test with the butyrefractometric test.

From data obtained with genuine samples, it was found that "(1) the Crismer number in conjunction with the butyrefractometer affords a satisfactory method for rapidly sorting samples of butter, genuine samples having usually a Crismer number of 55° C. and a butyrefractometer difference of -2.5; (2) samples which may be regarded as doubtful are those which have a high Crismer number, together with a butyrefractometer difference of +1.5 or more, and those which have a low Crismer number with a butyrefractometer difference of -1.5 or more; and (3) in the case of margarin, if animal fat is used the Crismer number is over 65, whereas if vegetable fat is used the number is below 50. The former gives a marked plus and the latter a marked minus butyrefractometer difference."

The Crismer test is also said to give good results in the detection of the adulteration of lard. The following Crismer numbers have been obtained with other facts: "Sesame oil 67.5, almond oil 64, cottonseed oil 61.5, arachis oil 57.5, olive oil 56, cocoa butter 47, tallow 34.5, palm oil 22, coconut oil 15 and 19.5, palm kernel oil 13.5."

The detection of cane sugar in milk, G. D. ELSDON (*Analyst*, 43 (1918), No. 509, pp. 292, 293; *abs. in Chem. Abs.*, 12 (1918), No. 23, p. 2387).—The following modification of the resorcinol test for milk is described:

One cc. of 3 N hydrochloric acid and 0.5 gm. of resorcinol are added to 15 cc. of milk. Five drops of the resulting mixture are placed on a white tile, which is then put on a boiling water bath to dry. A red coloration indicates the presence of cane sugar. With the test as thus modified, it is said to be possible to detect as little as 0.02 per cent of sugar.

The influence of various methods of obtaining milk serum on the refraction and specific gravity of the serum, J. C. VAN DER HAERST and C. H. KOERS (*Pharm. Weekbl.*, 55 (1918), No. 31, pp. 1060-1067; *abs. in Chem. Abs.*, 12 (1918), No. 22, p. 2388).—Specific gravity and refraction determinations are reported on milk serum obtained by the spontaneous souring, the calcium chlorid, and the acetic acid methods from various samples of undiluted milk and of milk diluted with 5 and with 10 per cent of water.

A comparison of the results obtained, which are reported in tabular form, showed that only with serum prepared by the calcium chlorid method does the lowering of the specific gravity and refraction by the addition of 10 per cent of water exceed possible differences in natural undiluted milk. The addition of 5 per cent of water can not with surety be detected by any of these methods.

The examination of commercial dextrin and related starch products, F. W. BABINGTON, A. TINGLE, and C. E. WATSON (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 15, pp. 257T, 258T).—The following method is described for the determination of dextrin gum in commercial dextrin.

One gm. of the sample is warmed in a 100 cc. graduated flask with 30 cc. of water until just gelatinized. Fifty cc. of a cold saturated barium hydroxid solution is then added, followed by enough water to bring the volume up to 100 cc. The solution is filtered and 50 cc. of the filtrate pipetted into a platinum dish. The excess of barium hydroxid is titrated with N hydrochloric acid. A weighed amount of sand is added and the dish dried to constant weight. It is then heated strongly to drive off organic matter, and after cooling and weighing the amount of dextrin gum is calculated from the differences in weight before and after ignition.

The method is said to give a probable error of less than 5 per cent.

Moisture in raw rubber, G. S. WHITBY (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 16, pp. 278T-280T, fig. 1).—This paper reports observations made under actual tropical conditions on the variation of the water content of raw rubber and the relation of this quantity to the humidity of the atmosphere, the form of the rubber, and the presence of serum solids. The rubber used in the investigation was produced by acetic acid coagulation from the latex of *Hevea brasiliensis* (the common plantation rubber tree). The following conclusions are drawn:

"The percentage of moisture in raw rubber in the form of sheet or crêpe varies considerably with the degree of humidity of the surrounding atmosphere. In rubber-producing climates it shows a diurnal variation. Sheet rubber tends to retain a higher percentage of moisture than crêpe. The moisture-retaining capacity of raw rubber is closely associated with the presence of serum solids. The latter are very hygroscopic."

A rapid micro-method for the determination of phosphate and total phosphorus in urine and stools, A. SATO (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 473-477).—The method is a colorimetric one and depends upon the precipitation of phosphate by uranium. The precipitated phosphate is dissolved in acid, and the color developed by the addition of potassium ferrocyanid is compared with that produced by the same reagent added to a standard uranium phosphate solution. Detailed directions are given for the determination of total phosphorus and inorganic phosphates in urine and in feces.

The method is said to have yielded results differing by not more than 2 per cent from those obtained by the ordinary gravimetric methods.

The estimation of creatinin and of creatin in the blood, I. GREENWALD and GRACE MCGUIRE (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 103-113, fig. 1).—Methods in use by other investigators are discussed, and new methods are proposed for the determination of creatin and creatinin in blood. In one the precipitation is brought about by dilute acetic acid and dialyzed iron and in another by trichloroacetic acid.

The authors have found that creatinin is almost completely removed from a dilute solution after shaking with kaolin, while creatin is unaffected. This is made the basis of a method described for the determination of creatin in blood.

Results obtained by the proposed methods are somewhat lower than those obtained by the Folin method, and it is thought that the difference in values is due to the removal by the kaolin of a basic substance which, after heating with hydrochloric acid, reacts with picric acid and sodium hydroxid, as does creatinin. It is stated that further investigation will be required to determine the usefulness of these methods as aids to diagnosis and to the study of disease.

The determination of creatinin and creatin in blood, W. DENIS (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 513-516).—A method of determining creatin and creatinin in blood is described which is said to be convenient to use when it is desirable to determine both nonprotein nitrogen and creatinin in the same

sample of blood. The method of precipitation is essentially the same as that described by Folin and Denis (*E. S. R.*, 36, p. 316) for the determination of nonprotein nitrogen in blood by direct nesslerization.

For the determination of preformed creatinin a 10 cc. portion of the filtrate thus obtained is measured into a 25 cc. flask, and 10 cc. of saturated picric acid solution and 2 cc. of 10 per cent sodium hydroxid solution are added. The flask is allowed to stand for 10 minutes, made up to volume, and read against an appropriate standard.

To determine total creatin (creatin plus creatinin) 10 cc. of the original filtrate in a 50 cc. flask is heated for half an hour in an autoclave at 120° C. When cool the same reagents are added as in the first determination, and the liquid is made up to volume and read against an appropriate standard. A table is given of the results obtained by this and by the Folin method.

The figures obtained for preformed creatinin are slightly lower than those obtained by the Folin method. The author concludes that "the method of protein precipitation used has eliminated, to a certain extent at least, the reducing bodies other than creatinin to the presence of which have been attributed the high results obtained by the picric acid precipitation."

A simple application of the Volhard principle for blood plasma chlorids, W. C. RAPPEYE (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 509-512).—The method described is an application of the Volhard principle, consisting in the precipitation of the chlorids by a standard solution of silver nitrate and the consequent titration of the excess silver nitrate by potassium sulphocyanate, using iron-ammonium-alum as an indicator. In adapting the method to the determination of blood plasma chlorids the solutions of the various reagents were made sufficiently dilute so that the error in a variation in back titration of a single drop is reduced to less than 1 per cent. The strength of solutions employed and method of procedure are given in detail, and the results obtained are compared with those obtained by the McLean and Van Slyke method.

The use of thymolsulphophthalein as an indicator in acidimetric titrations, A. B. CLARK and H. A. LUBS (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 9, pp. 1443-1448).—The authors discuss the use of thymolsulphophthalein (*E. S. R.*, 36, p. 111) in differential acidimetric and alkalimetric titrations and illustrate the method of employment by a few typical titrations. It is shown that any acid with a dissociation equal to or weaker than acetic acid may be differentially titrated in the presence of hydrochloric acid, provided that the weaker acid is completely neutralized when the alkaline color of the indicator occurs.

A method for the rapid analysis of mixtures of chlorinated toluene, H. A. LUBS and A. B. CLARK (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 9, pp. 1449-1453, figs. 2; *abs. in Chem. Abs.*, 12 (1918), No. 22, p. 2292).—An application of the method noted above is given in a description of a method for the determination of the composition of the mixtures of the side-chain chlorination products of toluene.

A mixture of benzyl chlorid, benzal chlorid, and benzotrichlorid can be hydrolyzed with pure water and the resulting hydrochloric and benzoic acids separately determined in a single titration with standard alkali, using thymolsulphophthalein as an indicator. The accuracy of the method is said to depend upon the accuracy of the titration of benzoic acid in the presence of hydrochloric acid, but to be reliable to ± 1 to 2 per cent.

The use of benzaldehyde sulphite compound as a standard in the quantitative separation and estimation of benzaldehyde and benzoic acid, G. A. GEIGER (*Jour. Amer. Chem. Soc.*, 40 (1918), No. 9, pp. 1453-1456).—The method employed in the determination of benzaldehyde in the presence of benzoic acid

is a modification of the method described by Denis and Dunbar (E. S. R., 21, p. 304). On account of the difficulties experienced in preserving pure benzaldehyde for use as a standard, the sodium sulphite addition product was substituted and found to be admirable for the purpose, as it is of known composition, comparatively stable, easily dried, and breaks up into a definite quantity of benzaldehyde on treatment with sodium hydroxid in aqueous solution.

Valuation of raw sugars, W. D. HOBNE (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 10, pp. 809-812).—The important points to be taken into consideration in the valuation of raw sugars are outlined, and tests for grading sugars on these points are described in detail. These tests include determinations of the yield and purity of the washed sugar, the amount of defecation required, the speed of filtration, and the readiness of decolorization.

The recovery of potash from beet-sugarhouse waste liquors, H. E. ZITKOWSKI (*Sugar [New York]*, 20 (1918), No. 9, pp. 354-356).—Proximate analyses of sugar beets from Colorado, California, and Wisconsin are reported, together with the percentage composition of their mineral matter.

From the average of the three analyses reported the 6,000,000-ton crop of beets in 1916 contained 12,700 tons of nitrogen, 3,780 of phosphoric anhydrid, and 18,180 of potassium oxid. Present and possible methods of recovery of the potash from the waste liquor are described, and the possibilities of recovering other products are discussed.

Homemade sorghum evaporators, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 9, pp. 279, 280, figs. 2).—Plans are given with accompanying diagrams for the construction of a simple outfit for boiling sorghum juice as previously noted (E. S. R., 39, p. 510).

Home canning, drying, and preserving, A. LOUISE ANDREA (*Garden City, N. Y.: Doubleday, Page & Co.*, 1918, pp. XVI+150, pls. 16).—General canning directions are given, together with many recipes.

The evaporation of apples, A. F. BARSS (*Better Fruit*, 13 (1918), No. 3, pp. 9, 17-19, fig. 1).—This article contains general suggestions for the various steps in the process of evaporation of apples.

Cider apple jelly, B. T. P. BARKER (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 14, pp. 243T-246T).—A method of converting cider apples into a palatable jelly with the addition of little or no sugar is described.

Conditions necessary for a proper "gel" formation were found to be a total sugar content of from 60 to 65 per cent, acid (preferably malic, citric, or tartaric) equivalent to 1 per cent malic acid, and a suitable form of pectin in quantities of 0.5 per cent or more. It was found more economical in practice to raise the content of total sugar in the unconcentrated juice (about 10 per cent) to approximately 20 per cent by the addition of cane sugar or a mixture of cane sugar and corn sirup, and to add generally a limited quantity of pectin extract to the juice before evaporation. The extract was made by passing waste steam from the evaporator for some time into a mass of pressed apple pomace and extracting the resulting mucilaginous liquid. The extract thus obtained was added to the apple juice at the rate of 15 gal. of extract to 100 gal. of juice. In the concentration of the juice a safe indication that the jellying stage had been reached was found to be the comparatively sudden change from opacity to relative clearness, a change which is believed to be due to the interaction of the sugar, acid, and pectin contents.

Manufacture of paper pulp, etc., from dead leaves, KAREN BRAMSON (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 21, pp. 853, 854).—The author suggests the practicability of utilizing dead leaves for the manufacture of paper pulp and other products.

The leaves may be crushed and separated into two parts—the veins and powder. The veins, which form the primary material for the paper pulp, are submitted to a rapid lixiviation, followed by washing and bleaching, and are then ready to be used as pulp. The powder can be used as fuel when compressed into briquettes either alone or mixed with carbon, or can be subjected to destructive distillation, yielding a carbon of high calorific value, tar, acetone, and pyroligneous acid. It is also suggested that the powder can be used as a feeding stuff.

The separation and uses of cacao shell, A. W. KNAPP (*Jour. Soc. Chem. Indus.*, 37 (1918), No. 14, pp. 240T-242T).—This is a summary of information on the separation, composition, and uses of the shell of the cacao bean.

METEOROLOGY.

Climate and plant growth in certain vegetative associations, A. W. SAMPSON (*U. S. Dept. Agr. Bul.* 700 (1918), pp. 72, figs. 37).—Investigations here reported were conducted in the vicinity of the Great Basin Forest Experiment Station in the Manti National Forest in central Utah in connection with the following plant associations and elevations: Sagebrush-rabbit-brush association 5,200 to 6,500 ft., oak-brush 6,500 to 7,800, aspen-fir 7,500 to 9,500, and spruce-fir 9,000 to 11,000. Meteorological observations were made at elevations of 7,100, 8,700, and 10,000 ft.

The investigations were concerned chiefly with “(1) recording and summarizing the meteorological data, and (2) determining the relation of certain potent weather factors to growth, water requirement, and certain other physiological functions of standard plants developed under different climatic conditions. Measurements of growth and certain other activities were recorded from time to time throughout the season. The plants used in each station were a pedigreed strain of Canadian field pea (*Pisum arvense*) known as the Kaiser variety, cultivated wheat (*Triticum durum*) known as Kubanka No. 1440, and mountain brome grass (*Bromus marginatus*) native to the Rocky Mountains.”

Plants were grown in potometers 17 in. deep and 14 in. in diameter, each capable of holding 90 lbs. of air-dry soil. “The cans were fitted with lids of the same material as the cans, and five holes $\frac{3}{8}$ in. in diameter were punched in each for the plants. In the center of the cover a hole $1\frac{1}{2}$ in. in diameter was provided, which was used in watering and was fitted with a cork stopper and a capillary tube bent at right angles. Before placing the lid, sufficient soil was removed in the center of the can to make room for a graniteware receptacle 4 in. in height by 5 in. in diameter, perforated centrally in the bottom and underlaid with $1\frac{1}{2}$ in. of gravel. This greatly facilitated the addition of water. To add the water, a flask of known capacity was inverted and the water permitted gradually to percolate into the soil. After the lids were placed, the spaces between the rims and cans were closed by securely sealing them over with strips of surgeon's adhesive tape $2\frac{1}{2}$ in. in width. The adhesive tape was then coated with shellac to prevent its loosening when wetted by rain. The method used in sealing and watering the plants was one devised by Briggs and Shantz [*E. S. R.*, 29, p. 825], modified somewhat to suit special conditions.” The data obtained are reported and discussed in detail.

It was observed that the mean annual temperature increased gradually from the highest to the lowest type and that the time from the beginning of growth to the occurrence of killing frosts was about 120 days in the oak-brush type, 105 in the aspen-fir type, and 70 in the spruce-fir type. The normal annual precipitation was greatest in the aspen-fir association, but only slightly heavier than in the spruce-fir. Less than one-half as much precipitation was recorded

in the sagebrush-rabbit-brush association as in the aspen-fir, and in the oak-brush type it was only slightly greater than in the sagebrush-rabbit-brush type. The precipitation was rather uniformly distributed throughout the year. Evaporation during the main growing season was greatest in the oak-brush type, but owing to high wind velocity in the spruce-fir type the evaporation was nearly as great as in the oak-brush. The wind movement was about 100 per cent greater in the spruce-fir association than in the types immediately below. Sunshine duration and intensity were practically the same in all the types studied.

"Temperature summations on a physiological basis according to the Lehenbauer plan have shown much promise in correlating air temperature with physiological plant activities. The summation of the effective temperature, namely, the temperature above 40° F., as proposed by Merriam, also appears to have much promise. This method in general compares favorably with temperature summations made on the physiological (Lehenbauer) basis. Summations of average daily mean and seasonal mean temperatures appear to have little value in showing correlations between the factor in question and physiological activities in plants. The evaporation for short periods, such as a part of a day or a fractional part of a week, for example, when compared with relative humidity, temperature, and wind velocity, can be obtained more accurately by means of the porous cup atmometer than by the free water surface evaporimeter of the Weather Bureau pattern. For periods of a week or longer either instrument will serve."

The general conclusion reached is that "in this locality Kubanka wheat and Canadian field peas, and doubtless other agricultural crops, can not be grown profitably at elevations exceeding about 8,000 ft. because of the lack of sufficient heat. As has been shown by the crop production of the region, enough heat units were produced in the seasons studied up to an altitude of about 8,000 ft., which includes most of the oak-brush type, to mature wheat, peas, and certain other crops. The amount of precipitation received at an elevation of 8,000 ft. and lower, however, was below the requirements of crop production, indicating that the lands must either be irrigated or the moisture conserved by thorough summer fallowing. The native forage crop produced in the oak-brush type, on the other hand, is fairly luxuriant, and if properly utilized will continue to be of high value in the pasturing of live stock. On the more favorable sites from the oak-brush up to and including the spruce-fir association, lands which have been overgrazed and are not fully stocked with vegetation may be increased in forage production by the seeding of suitable plants, preferably native species [E. S. R., 32, p. 227].

"Since evaporation is apparently the chief factor limiting growth and development of plants in the oak-brush and spruce-fir types, the extension of agriculture and forestry should be limited to lands protected from excessive evaporation. This may be done by selecting sites that are more or less protected by native vegetation and natural obstacles. Failures in experimental plantings, in most instances, have occurred on wind-swept lands where the soil moisture becomes deficient early in the season. In the selection of species, either of herbaceous or of woody plants, only the most drought-resistant sorts should be used. Failures in the case of the planting of suitable timber species in the central (aspen-fir) type will probably seldom be caused by adverse climatic conditions. Failures in this type may generally be traced to the employment of unsuitable stock, or to bad workmanship, wrong season of planting, or other preventable causes."

Critical months of the crop-growing season (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 9, pp. 110, 111*).—Data compiled from the monthly "condition re-

ports" of the Bureau of Crop Estimates are tabulated and discussed. A summary of the average monthly condition of various crops for a number of years is given, as follows:

Average condition of crops, by months.

[For the first of the month, except that for cotton, the date is the twenty-fifth of the preceding month. 100 per cent=normal condition.]

Crop.	Number of years covered, ending with 1917.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Corn.....	28					86.5	82.0	78.8	78.3	.....
Wheat—winter.....	27	90.8	84.4	85.1	81.0	80.5				.....
Wheat—spring.....	28				93.1	86.5	80.2	77.3		.....
Oats.....	28				89.1	86.1	82.1	80.1		.....
Barley.....	28				89.8	87.0	83.7	82.0		.....
Rye.....	28	94.0	89.3	89.8	89.7	88.7				.....
Buckwheat.....	28						90.2	86.1	81.5	.....
Flaxseed.....	15					87.2	81.6	78.6	77.2	.....
Rice.....	20					88.2	87.2	87.4	85.0	.....
Potatoes.....	28					90.4	84.4	77.4	74.2	.....
Sweet potatoes.....	27					88.6	86.7	85.2	82.6	.....
Hay (lame).....	10				87.6	88.5				.....
Pasture.....	28			88.1	91.4	89.9	85.5			.....
Cotton.....	28				82.5	82.7	80.8	78.6	68.0	.....
Tobacco.....	28					85.4	80.9	80.7	82.3	.....
Apples.....	23				70.6	82.2	87.2	86.1	85.5	.....
Peaches.....	25				61.6	56.9	54.7			.....
Pears.....	10				67.3	62.2	61.1	64.6	65.6	.....
Grapes.....	14					87.1	84.8	83.2	83.2	.....
Field beans.....	11				86.3	86.4	84.6	79.9		.....
Field peas.....	12				85.2	85.7	84.7	83.4	78.8	.....
Peanuts.....	12					86.1	84.9	84.8	83.1	.....
Sugar cane.....	11				86.4	86.4	85.8	86.6	83.4	.....
Sugar beets.....	12				90.4	90.1	89.8	90.2	89.4	90.9
Sorghum, for sirup.....	21					87.3	84.3	83.8	83.5	.....
Cabbage.....	12				87.1	86.7	84.0	81.1		.....
Cantaloups.....	12				80.6	79.3	77.5			.....
Onions.....	12				89.5	88.3	86.2	83.1		.....
Tomatoes.....	12					85.3	83.0	79.6		.....
Watermelons.....	12				79.7	78.8	75.7			.....

¹ Abandoned acreage is included in the condition report for April, and is excluded for May and subsequently.

The general deductions drawn from the data are that the critical period for winter wheat and rye is December-March; for hay, apples, peaches, and pears, June; corn, spring wheat, oats, barley, flaxseed, pasture, tobacco, grapes, sorghum for sirup, cantaloups, and watermelons, July; potatoes, cotton, field beans, cabbage, onions, and tomatoes, August; buckwheat, rice, sweet potatoes, field peas, peanuts, sugar cane, and sugar beets, September. "Potatoes are a crop that persistently deteriorates in large degree throughout the whole season. . . . A peculiarity of fruits is that their critical month is the first one; after that, the decline diminishes, and in the case of pears there is improvement in August and September. Vegetables, on the other hand, have their critical time at the end of the season."

As a rule "all crops fall below normal production at the harvest." Weighting the crops mentioned in the table according to their importance, "it is found that on the average their condition at time of harvest is 20.4 per cent below normal."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, E. M. BUFFUM, and H. BERMAN (*Massachusetts Sta. Met. Buls. 357-358 (1918), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudi-

ness, and casual phenomena during September and October, 1918, are presented. The data are briefly discussed in general notes on the weather of each month.

Ohio weather for 1917, W. H. ALEXANDER and C. A. PATTON (*Ohio Sta. Bul.* 324 (1918), pp. 489-576, figs. 63).—Tables showing temperature and rainfall for the entire State in comparison with similar data recorded at the experiment station at Wooster are supplemented by a series of diagrammatic maps showing the comparative weather conditions for the various sections of the State.

The mean temperature for the year at the experiment station was 46.3° F.; for the State, 47.9°. The highest temperature at the station was 96°, July 31; for the State, 103°, July 31. The lowest temperature at the station was -19°, December 30; for the State, -31°, December 11. The annual rainfall at the station was 31.82 in.; for the State, 36.51. The number of rainy days at the station was 134; for the State, 118. The prevailing direction of the wind was southwest at the station and in the State at large.

SOILS—FERTILIZERS.

Subsoiling, deep tilling, and soil dynamiting in the Great Plains, E. C. CHILCOTT and J. S. COLE (*Jour. Agr. Research* [U. S.], 14 (1918), No. 11, pp. 481-521, figs. 4).—In this article, a contribution from the Bureau of Plant Industry, reviewing all of the available investigations on this subject, the authors state that "recognizing the fact that there may be times and places giving results favorable to subsoiling or other methods of deep tilling, the average yields obtained in the extensive experiments here reported seem to warrant the conclusion that as a general practice for the Great Plains as a whole no increase of yields or amelioration of conditions can be expected from the practice. In their relative response to deep tillage there is no marked difference to be observed between crops. Subsoiling and deep tilling have been of no value in overcoming drought. The effect, on the contrary, apparently has been to reduce the yields in those seasons that are below the average in production. Experiments have been conducted with the subsoil plow, the Spalding deep-tillage machine, and dynamite. The effect or lack of effect of deep tillage appears to be essentially the same, irrespective of the means by which it is accomplished.

"These conclusions are the result of extensive experiments covering a wide range of crops, soils, and conditions in the Great Plains. Experiments conducted in the Great Basin under semiarid conditions with the greater part of the precipitation occurring in the winter, under humid conditions in the States of Illinois, Pennsylvania, and Mississippi, under semiarid conditions at San Antonio, Tex., and under semiarid conditions on the black soil of southern Russia have all led to the same conclusion—that yields can not be increased nor the effects of drought mitigated by tillage below the depth of ordinary plowing. The quite general popular belief in the efficiency of deep tillage as a means of overcoming drought or of increasing yields has little foundation of fact, but is based on misconceptions and lack of knowledge of the form and extent of the root systems of plants and of the behavior and movement of water in the soil."

Soil surveys, field experiments, and soil management in Iowa, W. H. STEVENSON and P. E. BROWN (*Iowa Sta. Circ.* 51 (1918), pp. 3-23, fig. 1).—This circular outlines the plan of the soil survey work and fertilizer experiments in progress throughout the State for the use of county agents or farmers who may desire to undertake similar tests in their particular locality. A summary of various publications containing the results of experimental work and recommendations for soil treatment is also presented, including bulletins dealing with a plant food survey of Iowa soils; the need, use, and value of lime on Iowa

soils; studies of the special needs of peat soils and of the so-called "alkali," "push," and "gumbo" soils; and experiments on the use and value of manure and commercial fertilizers, the rotation of crops, the inoculation of legumes, and the control of erosion. Information as to what the experiment station can and can not do to help the farmer along these lines is included, and notes on the cost of carrying out the tests described are appended.

The soils of Missouri, M. F. MILLER and H. H. KRUSEKOPF (*Missouri Sta. Bul. 153* (1918), pp. 5-130, pl. 1, figs. 58).—This bulletin presents a report and general map dealing with the soils of the State and embracing an area of 43,985,280 acres. In the preparation of the map use was made of the detailed county soil maps prepared by the Bureau of Soils of the U. S. Department of Agriculture, together with those made by the bureau in cooperation with the station. A modification of the reconnaissance-survey map of the Ozark region prepared by Marbut (E. S. R., 24, p. 129) was employed for that region and special reconnaissance surveys were made of the remaining counties of the State.

The topography of the State varies from level to gently rolling prairies in the north and west and from broad flat plains in the extreme southeastern part to the rough, mountainous, deeply dissected Ozark region. The elevations range from about 290 ft. in the southeastern corner to about 1,800 ft. in the Ozark region. The soils of the State comprise glacial and loessial deposits; residual formations derived from limestone, sandstone, and shale; and alluvial deposits.

The different soil types occurring in the State are described and the results of analyses reported, showing the total nitrogen, phosphorus, and potassium content and the lime-requirement of each soil type.

Statistical data relating to Missouri agriculture are also presented by means of maps and charts.

Variations in the moisture content of the surface foot of a loess soil as related to the hygroscopic coefficient, F. J. ALWAY and G. R. McDOLLE (*Jour. Agr. Research* [U. S.], 14 (1918), No. 11, pp. 453-480, figs. 5).—This paper reports a study at the Nebraska Experiment Station in 1910 and 1912 of variations in the moisture content of the various inch sections of the surface foot of soil in fields near Lincoln, Nebr., during seasons which were exceptionally favorable to the development of both the dryest and the moistest conditions ordinarily encountered there. The methods employed and the data secured are given in detail.

The outstanding facts established were that "after prolonged dry weather following good rains the soil without plant cover through the first few inches shows a rapid rise in moistness from the surface downward, while where there is a full stand of plants, as in the grass fields, the rise is slight and a low ratio extends beyond the twelfth inch. Where a moderate rain has fallen after the latter condition has once been established, there will be a high and comparatively uniform degree of moistness through several inches and then a sharp fall, but where very heavy rains have fallen there will be almost uniformly high ratios."

In the loess soils used in these experiments, the moisture and phosphoric acid and potash were, other things being equal, as readily yielded to the plant roots in the lower as in the upper layer of the soil. The upper half of the surface soil may, under certain conditions, be more important as a source of mineral nutrients than the lower, "but this is due to the depth of penetration of rains and not to the depth of the plowline, nor to the distribution of the roots."

Soil solution as an index of the biological changes in the soil, J. F. MORGAN (*Michigan Sta. Tech. Bul. 39* (1917), pp. 5-24, figs. 6).—The value of the soil solution obtained by the so-called oil pressure method (E. S. R., 39, p. 20)

as a material basis for the study of biochemical changes occurring in the soil is believed to have been established by the results secured in an investigation of the changes occurring in solutions obtained from variously treated soils.

Dried blood, tankage, cottonseed meal, bone meal, hoof meal, ammonium sulphate, and sodium nitrate were added to a sandy loam soil, the mixture was placed in boxes 15 by 10 by 11.5 in., and soil extracts were examined at varying intervals with regard to their specific gravity, specific conductivity, freezing point depression, total solids, and reaction of nitrogen as ammonia, nitrite, and nitrate. In addition, tests were made with similarly treated soil in tumblers by means of water extracts. For purposes of comparison, the decomposition of dried blood in a sandy and in a heavy silt loam soil was also studied. The data are presented in tabular form, and the amount of ammonification and nitrification of the different materials is indicated graphically.

The soil solutions from the treated soils were found to be more concentrated than their respective controls, due to the action of the decomposing organic matter added. On account of its rapid decomposition, dried blood gave quicker results than the other materials. Nitrification was well illustrated during the different periods of decomposition of the nitrogenous materials by the study of solutions obtained by extracting similarly treated soils at definite intervals.

As compared with the tumbler method, the box method required a larger and more representative sample of soil, sufficient for extraction by the oil pressure method, and furnished a solution deemed to be fairly representative of soil conditions and of sufficient quantity for detailed study. The water extract obtained in the tumbler method is said to have been too dilute for exact determination, and, when reduced to its natural concentration, the properties of the solution are changed.

The treated soils contained a larger number of microorganisms than their respective controls. Both the bone meal and hoof meal produced a slight increase in phosphoric acid, while the latter yielded more nitrate than the former. The decomposition of dried blood occurred more rapidly in open sandy soil than in close textured heavy silt loam soil.

A method for the counting of certain protozoa in the soil, A. ITANO and G. B. RAY (*Soil Sci.*, 5 (1918), No. 4, pp. 303-310).—The authors state that in their work on soil protozoa the use of the blood-counting apparatus described by Kopeloff, Lint, and Coleman (*E. S. R.*, 33, p. 809) proved to be generally satisfactory, except when the number of organisms in the sample fell below 400 per cubic centimeter of suspension and when any chance particles of soil with a diameter greater than 0.1 mm. had been carried into the chamber. As a consequence, a modified method was devised based on the principles of the Sedgwick-Rafter cell, used in the estimation of plankton in water, together with a vital stain and a semi-solid diluent.

The cell employed was prepared by E. A. Thompson, and consisted of a slide 75 by 25 mm. upon which was cemented a brass plate exactly 1 mm. in thickness having in the center an opening 50 by 20 mm. Phenolsulphonaphthalein was used as a stain, and the diluent consisted of a 4 per cent solution of gelatin, the reaction having been adjusted to approximately P_H 8 by the addition of fifth-normal sodium hydroxid. Counts of large ciliates and small flagellates were made with and without the stain and with and without sand as an indicator of the relation of time of settling to the total number of organisms.

The data are presented in tabular form and are held to indicate that the use of a vital stain aids materially in defining the organism. The use of a semi-solid diluent inhibits rapid motion. The counts are seriously affected when the soil is allowed to settle, but soil particles do not appear to affect the accuracy

of the counts, especially when the vital stain is used. The probable error seems to vary inversely with the size of the organisms and directly with the magnification.

The cell did not permit a magnification that would include all of the protozoa in the soil, nor did it allow for the possibility of the organisms being concealed by the soil particles. The procedure is said to be simple and quick, and the apparatus inexpensive.

Variability in soils and its significance to past and future soil investigations.—I, A statistical study of nitrification in soil, D. D. WAYNICK (*Univ. Cal. Pubs. Agr. Sci.*, 3 (1918), No. 9, pp. 243-270, figs. 2).—This paper presents the results of a study of variability occurring in an apparently uniform soil as measured by nitrate production in 81 samples of a silty clay loam taken from a circular plat having a diameter of 100 ft. The area selected was located on the university farm at Davis, Cal., and was regarded as specially uniform. Samples were taken of the surface soil to a depth of 6 in. and of the subsoil to a depth of 24 in. Determinations were made of the nitrate present at the time of sampling and that produced from the soil nitrogen, from ammonium sulphate, and from dried blood after 28 days' incubation. Statistical methods were applied in an interpretation of the results, and the data are presented in tabular form and fully discussed. The following conclusions are deemed justified:

"The variability of the field samples of soil, even from an apparently uniform area of limited extent, is high and is a factor of extreme importance in an estimation of the reliability of any series of results. The variability of the samples treated as in the tumbler method for nitrification studies is increased over that found for the nitrate produced in the field. Subsoil samples vary more in the field and when treated with fertilizers in the laboratory than surface samples taken from the same area. No explanation of this fact can be offered at the present time. A single sample of any soil is of little value as regards determinations which may be made upon it. A limited number of samples, as 10 or 16, are subject to wide variations and can only be used when the results are to be interpreted as having a low degree of accuracy. A composite sample may be considered as of value only after the probable error to which it is subject is known, and this can only be determined by the use of a large number of individual samples. The distance apart samples are taken is of little importance as long as the samples are uniformly distributed over an area which is apparently uniform.

"In the light of these results, the conclusion seems inevitable that much of the past work done, as regards nitrification at least, must be critically examined to determine the degree of reliability, if any, it may have."

Soil fertility, L. E. CALL and R. I. THROCKMORTON (*Kansas Sta. Bul.* 220 (1918), pp. 3-40, figs. 11).—Corn yields in Kansas are said to have decreased 40 per cent and wheat yields 17 per cent during the past 50 years, due to the loss of the natural fertility of the soil. The addition of organic matter is deemed to be the most important factor in increasing productivity, through the liberation of plant food, and means of increasing and maintaining the organic matter contained in the soil are described. Applications of fresh or well-preserved barnyard manure, plowing under green manures, straw, and other crop residues, and the employment of a crop rotation including a sod crop are suggested.

Corn grown in different rotations gave a maximum yield in 1917 of 44.9 bu. per acre, following alfalfa 4 years, corn 2 years, and wheat 1 year, as compared with 17.6 bu. for corn grown continuously for 8 years. A comparison

of farming operations in two counties in eastern Kansas indicated a very marked difference in the reduction in yield of corn for the past 40 years, depending largely upon the area devoted to leguminous crops and tame grasses in the respective areas. Less than 1 per cent of the land under cultivation in one county was occupied by these crops, and the corn yield had decreased almost 20 bu. per acre, while in the other county over 19 per cent of the cultivated area was in grasses, clover, and alfalfa, and the corn yield was only 8 bu. less than that 40 years previous.

Top-dressing wheat in the winter with 2.5 tons manure per acre at Manhattan resulted in a 7-year average yield of 22.2 bu., as compared with 14.9 bu. without manure. Similar tests conducted in the eastern one-fourth and central one-half of the State during 1914 to 1917, inclusive, resulted in average increases in favor of manure of 5.8 and 3.6 bu. per acre, respectively. An application of 5 tons of manure per acre annually to alfalfa produced 7,169 lbs., as compared with 3,324 lbs. from the untreated plot.

In fertilizer tests with wheat on shale soils in southeastern Kansas, the highest average yield for the period 1912 to 1916, inclusive, amounted to 20.2 bu. per acre with applications of potassium and phosphorus, as compared with 8.2 bu. from the untreated checks. With phosphorus alone the yield was 18.2 bu., and this is said to be the only chemical fertilizer to give profitable returns. Alfalfa also responded profitably to applications of phosphorus on all upland soils of the eastern one-third of the State.

Lime is deemed essential only on the soils of the eastern one-fifth of the State.

Experiments on growing serradella and early red clover with oats for green manuring, 1910-1916 (*Tidsskr. Planteavl*, 24 (1917), No. 4, pp. 614-616).—A brief report is presented on experiments in which serradella and early red clover were sown with oats and plowed under as green manure after the oats were harvested. Potatoes were grown after the oats and the influence of the treatment studied. In addition to the green manures a standard application of commercial fertilizers was applied.

Although drought prevailed every year except in 1916 and the oats were attacked at the same time by smut, the average results for the period showed that apparently the use of serradella had increased the yield of oats per hectare by 48 kg. of grain and 1,090 kg. of straw and the yield of potatoes by 2,400 kg., while the use of early red clover indicated a corresponding increase in the yield of oats of 58 kg. of grain and 463 kg. of straw and in the yield of potatoes of 2,600 kg. Without the growth of leguminous crops, the yield of oats was 1,004 kg. of grain and 1,748 kg. of straw and the yield of potatoes 16,800 kg. of tubers per hectare (1 kg. per hectare equals 0.89 lb. per acre).

Loss of organic matter in clover returned to the soil, G. E. BOLTZ (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 5, pp. 210-214).—The experimental results obtained and the conclusions reached in the studies described in this paper have been noted from another source (*E. S. R.*, 38, p. 622).

Illinois wheat yields with nature's fertilizers, C. G. HOPKINS ET AL. (*Illinois Sta. Circ.* 229 (1918), pp. 2).—This reports results for 1918 similar to those previously noted (*E. S. R.*, 38, p. 624).

The average yield of wheat from 10 fields in southern Illinois receiving no soil treatment was 6.2 bu. per acre, while applications of manure, lime, and rock phosphate; plant residues, lime, and rock phosphate; and plant residues, lime, rock phosphate, and kainit resulted in average yields of 19.7, 20.3, and 22 bu. per acre, respectively. Average yields from 14 fields in the Illinois corn belt amounted to 29.2 bu. from the soil alone, as compared with 39.2, 42.2, and 41.8 bu. per acre, respectively, for soil treatments similar to those noted above.

Experiments with night soil as manure, P. C. PATIL (*Agr. Jour. India*, 13 (1918), No. 2, pp. 281-286, pl. 1).—Applications of fresh night soil to millet, cotton, and rice at different points in India are said to have given very profitable returns. In a comparison of night soil and farmyard manure applied in 1904 to a rotation of cotton and millet in a study of the residual effects of the different materials, the former continued to show a marked superiority over the latter, even after 12 years. The method of applying the material is outlined.

New deposits of saltpeter in Brazil (*Rev. Sci. [Paris]*, 56 (1918), No. 14, p. 437).—Deposits, 600 sq. km. (232 square miles) in area, of 80 per cent potassium nitrate are reported to have been discovered in the State of Piauh, about 300 km. (186 miles) by rail from the port of Camocim.

Twenty years' work on the availability of nitrogen in nitrate of soda, ammonium sulphate, dried blood, and farm manures, J. G. LIPMAN and A. W. BLAIR (*Soil Sci.*, 5 (1918), No. 4, pp. 291-301, figs. 3).—This paper, a contribution from the New Jersey Experiment Stations, reports the continuation of work previously noted (E. S. R., 35, p. 123), with particular reference to the results of the last five years, which are said to confirm the earlier findings.

The conclusions reached may be summarized as follows: In a 5-year rotation on Penn loam soil well supplied with phosphoric acid, potash, and lime, crop yields were better maintained over a period of 20 years with nitrate of soda at the rate of 320 lbs. per acre than with an equivalent amount of ammonium sulphate or dried blood. The latter gave results for several years about on a par with the nitrate, but an average of the second 10-year period showed a considerable falling off. This is thought to be due to the fact that the nitrate, being immediately available, gives the plant an early start which tends to keep it in the lead, and to the further fact that in the transformation of the ammonium salt and the organic material into nitrates there is a considerable loss of nitrogen, possibly as ammonia gas, gaseous nitrogen, or both, although this loss can not all be attributed to a leaching out of the materials, even though the nitrification of ammonia and organic residues may go on throughout a large portion of the year.

Cow manure at the rate of 16 tons per acre gave somewhat larger yields than nitrate of soda, but the increased yields were not sufficient to justify the increase in the cost of nitrogen. Furthermore, the average yield with the manure was less for the second 10-year period than for the first, an application of 16 tons of manure per acre annually failing to maintain crop yields.

The percentage of nitrogen recovered in the crop for the 20-year average was as follows: Nitrate of soda 62.42, ammonium sulphate 47.48, dried blood 38.69, and cow manure 32.69 per cent. The average recovery with nitrate for the second 10-year period was 64.35 per cent as against 60.48 per cent for the first 10-year period, whereas the average recoveries with ammonium sulphate, dried blood, and manure were all less for the second 10-year period than for the first.

The results are held to indicate "that when properly used nitrate of soda alone as a source of nitrogen may be depended upon to maintain crop yields over a long period, and that a given amount of nitrogen in this form is more effective than an equivalent amount in the form of ammonium sulphate or organic materials. Its effect is to produce larger crops per unit of nitrogen, and these crops, in turn, leave behind in the soil larger crop residues, and, with carbonate of lime to aid in their decomposition, these furnish a sufficient supply of organic matter to keep the soil in good physical condition."

See also a previous note (E. S. R., 39, p. 327).

The synthesis of ammonia at high temperatures, I, II, E. B. MAXTED (*Jour. Chem. Soc. [London]*, 113 (1918), Nos. 665, pp. 168-172; 667, pp. 386-389).—In

the first of these articles evidence is brought forward to show that in all probability the ammonia content of a mixture of nitrogen, hydrogen, and ammonia in equilibrium, after decreasing with increasing temperature, eventually passes through a minimum and finally rises once more. Experimental data are presented to show that "considerable yields of ammonia may be obtained by cooling a mixture of nitrogen and hydrogen extremely rapidly from the temperature of the oxyhydrogen flame to that of the room. . . . The results obtained by induction discharge modified in such a way as to constitute a small, high-tension arc burning within a capillary tube, through which the mixture of nitrogen and hydrogen was passed," are also presented.

"By confining the action to a capillary tube, in the manner described, the gas to be treated may be brought uniformly into contact with the discharge, and it was found easily possible to obtain at atmospheric pressure yields of ammonia amounting to 1.5 per cent by volume of the gas mixture taken for treatment. Induction sparks, as such, were found to exert a comparatively feeble action on the synthesis, energetic formation of ammonia only taking place when the electrodes were brought sufficiently close together to transform the ordinary spark discharge into a small, high-tension arc, accompanied by a visible and apparently continuous flame of high temperature."

The author thinks that the results obtained in this investigation "offer considerable encouragement for the investigation of the formation of ammonia by rapidly cooled high-tension arcs of a larger size."

The possibility of obtaining nitrogenous fertilizers by utilizing waste materials for the fixation of nitrogen by nitrogen-fixing bacteria, C. J. T. DORLAND (*Abstr. Bact.*, 2 (1918), No. 1, p. 2).—Nitrogen fixation was observed to take place when molasses, orange juice, lemon juice, grapefruit juice, or wheat, oat, barley, rye, or flax straw was used as a source of energy. Waste paper, wood wastes, grass residues, and beet and cane sugar residues are believed to be equally effective. Data obtained in experimental work are held to indicate that nitrogen may be fixed by bacteria much more economically than by the present laboratory methods, and that cheap nitrogen production will be attained by utilizing waste materials as sources of energy, together with the correct combination of symbiotic microorganisms and the development by selection of highly efficient nitrogen-fixing strains. Modifications of the rapid vinegar process for waste liquids and of the activated sludge process for solid materials are regarded as possible points of departure for mechanical manipulation.

Analysis of experimental work with ground raw rock phosphate as a fertilizer, W. H. WAGGAMAN, C. R. WAGNER, and R. F. GARDINER (*U. S. Dept. Agr. Bul.* 699 (1918), pp. 119).—The authors describe an exhaustive examination of experiment station literature dealing with the subject. The discussion has to do primarily with 37 field experiments conducted at 13 stations for 5 years or longer, careful attention being given to the following factors deemed of special importance in their influence on the results of field work: Uniformity of experiment field; topography and drainage; chemical and physical composition of the soil; previous treatment of the field; climatic conditions; injuries from disease, insects, and animals; kinds of crops grown and selection of seed; rate of application and uniform distribution of phosphates; methods of comparing raw rock with other phosphates; effect of other fertilizers; number and distribution of plats; and duration of experiment. Laboratory, pot, and greenhouse investigations are also noted in less detail.

The relative merits of raw rock and acid phosphate were compared in 22 of the 37 tests, 13 of these giving crop yields favorable to rock phosphate. Of the 15 remaining experiments, 11 are said to have given results strongly indicating beneficial effects from the application of raw rock phosphate. In 21 tests re-

ceiving relatively light applications of rock phosphate (250 lbs. or less per acre) 15 showed distinctly favorable increases in yield, while in 16 experiments in which the applications were more liberal 13 resulted favorably. Raw rock phosphate was used in connection with organic matter in 23 experiments, 18 of which gave distinctly favorable results. With regard to the cumulative effect of raw rock phosphate, in 17 cases greater availability was observed after the material had been applied for a number of years.

As a result of inquiries addressed to 1,000 progressive farmers who had used ground raw rock phosphate for one or more years, 315 replies were received, of which 219 were favorable, 55 doubtful, and 41 unfavorable.

Based on the results of all laboratory, greenhouse, and field experiments reviewed, the following general conclusions are deemed justified: Field experiments conducted for one or two years, in which the various fertilizer treatments are not replicated or no index given to the relative natural fertility of the various plats employed, have little or no meaning. On most soils liberal and even medium quantities of raw rock phosphate produced increased yields with many crops the first year. The effectiveness of raw rock phosphate depends largely on its thorough distribution in the soil, brought about by liberal applications of very finely divided material and thorough cultivation. The presence of decaying organic matter in the soil increases the effectiveness of rock phosphate, due probably both to greater bacterial activity and the higher content of carbon dioxid in such soils. The effectiveness of raw rock phosphate is usually increased after remaining in the soil for a year or more.

Most crops respond more quickly to applications of acid phosphate than to bone, basic slag, or raw rock phosphate; hence, where the early stimulation and quick maturity of the crop are the main consideration, acid phosphate is probably the best form of phosphoric acid to apply.

Field experiments in which raw rock and acid phosphate are compared on the basis of equal applications of the two materials or on equal applications of phosphoric acid in the two forms result often in favor of acid phosphate, since in order to get the maximum benefit from the natural phosphates they must be applied at a rate far exceeding that at which acid phosphate proves effective. Whether increases in yield can ordinarily be produced more economically by applications of the soluble or relatively insoluble phosphates is deemed to be a separate problem for each farmer, since it depends on a number of factors of which the most important are the nature of the soil, the crop system employed, the price of the various phosphates in each particular locality, and the length of the growing season.

The agricultural availability of raw ground phosphate rock, W. H. WAGGAMAN and C. R. WAGNER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 442-444; *abs. in Chem. Abs.*, 12 (1918), No. 14, p. 1492).—This article presents a brief summary of the work noted above.

The use of "mine run" phosphates in the manufacture of soluble phosphoric acid, W. H. WAGGAMAN and C. R. WAGNER (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 353-355).—The authors briefly describe tests to determine the feasibility of smelting the so-called "mine-run" material of phosphate deposits in the electric furnace in an effort to avoid the expense and losses entailed in handling and washing the rock. Samples of the material were obtained from two fields in Florida and one in Tennessee, and they contained from 15.38 to 30.69 per cent of phosphoric acid. From 97 to 98.2 per cent of the phosphoric acid was volatilized after three hours' treatment in the furnace. The cost of producing 1 ton of phosphoric acid by smelting mine-run phosphate was found to be materially lower than that of treating high-grade phosphates.

Phosphate rock in the manufacture of fertilizers, M. WHITNEY (*U. S. Senate, 65. Cong., 2. Sess., Doc. 270 (1918), pp. 7*).—This document sets forth briefly the essential facts regarding the location, probable extent, and grade of phosphate deposits in the United States; the quantity and value of phosphate rock mined, exported, and used in the United States for fertilizing purposes, either raw or manufactured; the experimental work that has been done with reference to the use of raw ground phosphate rock as a fertilizer; and the necessity and function of phosphorus in crop production; with suggestions as to legislation having in view the development of the western phosphate deposits.

The rock and pebble phosphate deposits of Florida; the brown, blue, and white rock deposits of Tennessee; the nodular phosphates of South Carolina; the recently discovered deposits in Utah, Idaho, Wyoming, and Montana; the brown phosphate of Kentucky; and the phosphate deposits of Arkansas are briefly described. Estimates of the reserve supply of phosphate rock in these deposits are given, totaling 10,519,875,000 tons. This estimate, however, includes much low-grade material the recovery of which is not deemed commercially practicable.

It is stated that "in 1917 the production of phosphate rock in the United States amounted to 2,610,743 tons. There were, however, 2,653,829 tons actually marketed, as against a marketed output in 1916 of 2,081,467. . . . Prior to the world-wide war the amount of phosphate exported from this country was approximately equal to that consumed in the United States. . . . In 1917, as far as can be ascertained at present, only 33,999 tons of phosphate were exported. . . .

"With the exception of a relatively small tonnage used in the manufacture of phosphorus, practically all of the phosphate rock produced in this country is used for agricultural purposes. This means that at least 2,500,000 tons of phosphate rock were used in fertilizers in 1917." While the greater part of this is used in form of acid phosphate, it is estimated that 90,000 tons was used in 1917 in form of finely ground raw-rock phosphate as compared with 65,673 tons in 1916, an increase due to rise in price of acid phosphate.

Data regarding the experiments made in this country to determine the value of raw-rock phosphate as a fertilizer are discussed in detail in Bulletin 699 of the U. S. Department of Agriculture abstracted on page 818.

Origin of the western phosphates of the United States, G. R. MANSFIELD (*Amer. Jour. Sci., 4. ser., 46 (1918), No. 274, pp. 591-598*).—This article summarizes the opinions and hypotheses thus far advanced regarding the origin of the phosphate field occupying more than 2,600,000 acres and estimated to contain more than 5,290,000,000 long tons of relatively high-grade phosphate rock in northeastern Utah, southeastern Idaho, southwestern Montana, and western Wyoming. It is stated that all who have examined these phosphates in the field are agreed that they are original marine deposits, analogous to those of Tunis, Algeria, and England, and to the blue phosphates of Tennessee. The major features of the author's tentative working hypothesis regarding the origin of these phosphates are as follows:

The phosphatic oolites and their matrix were probably deposited originally as carbonate of lime in the form of aragonite in shoal water of warm or moderate temperature. The lands bordering the depositional area were low and furnished little sediment to the sea. The phosphatization of the oolitic deposit was probably subsequent to its deposition rather than coincident with it. "Cooler temperature in the waters of deposition, perhaps induced by changes in the character or direction of marine currents, checked the activities of the denitrifying bacteria and hence the conditions favorable for the formation of oolitic limestone. At the same time plant and animal life increased in the

waters and furnished the decaying matter necessary for the phosphatization of the oolitic limestone." The sea in which the phosphate was deposited was closed off on the east, south, and west, but may have had connections with the ocean northward and northwestward.

Phosphate rock in 1917, R. W. STONE (*U. S. Geol. Survey, Min. Resources U. S., 1917, pt. 2, pp. 7-18*).—Data regarding production, consumption, and trade in American phosphates are given in tables and text. It is stated that "the phosphate rock marketed in the United States in 1917 amounted to 2,584,287 long tons, valued at \$7,771,084, an increase of 601,902 tons in quantity and of \$1,874,091 in value over the production in 1916."

A notable feature of the phosphate rock industry of the last three years has been the decrease in exports. The decrease in 1915 from 1914 was nearly 711,000 tons, and was due to the European war. In 1916, with shipping conditions remaining about the same as in the previous year, the exports fell off further only about 10,000 tons. Early in 1917 the United States entered the war and there was another sharp decrease, amounting to 77,320 tons, from the exports of 1916." The total exports in 1917 amounted to 166,358 long tons valued at \$835,045. "Stocks on hand at the close of 1917 showed an increase for the entire country of 22 per cent, being well over 1,350,000 tons."

Does calcium carbonate or calcium sulphate treatment affect the solubility of the soil's constituents? C. B. LIPMAN and W. F. GEMOCKE (*Univ. Cal. Pubs. Agr. Sci., 3 (1918), No. 10, pp. 271-282*).—Experimental work is described which was planned to ascertain how calcium carbonate and calcium sulphate affect the water-soluble iron, calcium, magnesium, potassium, sulphur, and phosphorus in soils. Different amounts of calcium carbonate or calcium sulphate were added to Oakley blow sand, Berkeley clay adobe, and a greenhouse soil consisting of a mixture of barnyard manure and Berkeley clay adobe soil, and the mixtures were placed in pots in the greenhouse. Optimum moisture conditions were maintained for a period of nine months, beginning in March, 1917, and the soils were sampled three times at widely varying intervals. Water extracts were prepared by adding 800 gm. of the air-dried soil to 1,600 cc. of distilled water and allowing the mixture to digest for six days. Aliquot samples were then analyzed for the different constituents named. From the results obtained, the following conclusions were reached:

Soils may be distinctly affected as regards the solubility of their constituents by treatment with calcium carbonate or calcium sulphate, although all soils do not behave alike, but depend upon the nature of the physical-chemical systems dealt with and upon the composition of the soil mineral complexes. Potassium was found to be rendered more soluble by the addition of calcium carbonate or calcium sulphate to clay adobe soil and to a greenhouse soil, but not in the case of blow sand. The soluble calcium content was increased in all three soils studied. The soluble magnesium content of all three soils was increased by applications of calcium carbonate, but appeared to remain unaffected or to have been depressed by calcium sulphate treatment, with the exception of small applications to the Oakley blow sand and the greenhouse soil. The iron was thought to have been rendered slightly more soluble in the greenhouse soil and for a time in the blow sand, but not in the clay adobe soil. The soluble sulphur content of the greenhouse soil was increased by calcium carbonate applications, as was probably that of the blow sand. The phosphorus content of all three soils seemed to be unaffected by the different treatments.

The oxidation of sulphur by microorganisms in its relation to the availability of phosphates, H. C. McLEAN (*Soil Sci., 5 (1918), No. 4, pp. 251-290*).—This is a further contribution to the work previously noted (E. S. R., 39, p. 624).

A number of experiments are described which involve factors and influences attending the use of sulphur in rendering available the phosphorus of phosphates, and which are said to have established the value of inoculation and to have shown aeration to be a vital factor. The investigations embraced studies along the following lines: Economical sulphur-floats combinations, concentrated composts, effect of sulphur on different insoluble phosphates, the effect of fineness of division, the effect of aeration and inoculation, methods of inoculation, influence of soluble phosphoric acid, possible catalytic agents, and the effects of calcium carbonate, peat, and peptone on the availability of phosphorus. The data are presented in tabular form and fully discussed. The following conclusions are deemed justified:

A compost composed of 100 parts soil, 120 parts sulphur, and 400 parts floats appeared to be most economical for the production of available phosphoric acid. An appreciable amount of phosphoric acid was rendered available in composts consisting of only sulphur and floats, although the quantity was not so large as when soil was present, indicating that a stimulation of the sulfification processes may be brought about by some treatment, thus making possible maximum results in composts without the aid of soil. Of the natural tricalcium phosphates (Tennessee brown rock, Tennessee blue rock, and Florida soft rock) Florida soft rock phosphate appeared to be the most preferable for maximum yields of available phosphoric acid in composts containing sulphur.

Fineness of the constituents in composts is said to increase their efficiency, provided that the texture is not reduced to a fineness which will prohibit biological activities through lack of proper aeration. The biological factor is deemed influential in the oxidation of sulphur and hence in rendering available the phosphorus in floats. In inoculated composts, all other conditions being the same, the quantity of phosphorus rendered available in 9 weeks was found to be double that made available in uninoculated composts in 30 weeks. The question of aeration is believed to merit foremost consideration, the results of these investigations indicating that the microorganisms which oxidize sulphur are largely aerobic.

The presence of soluble phosphoric acid other than that contained in floats exerted no influence on the production of available phosphorus in soil-sulphur-floats composts. Ammonium sulphate, magnesium sulphate, calcium sulphate, and zinc sulphate were found to exert no influence on the production of available phosphorus, while sodium nitrate, potassium iodid, and copper sulphate exerted a marked depressing effect. The addition of 0.2 per cent sodium nitrate inhibited sulfification processes almost entirely. Under certain conditions ferrous sulphate, aluminum sulphate, and a combination of the two salts exerted a marked stimulating action on sulphur oxidation processes, when present in small amounts in a compost composed of soil, sulphur flour, and Tennessee brown rock phosphate, a mixture of the two causing the greatest stimulation. From the data obtained it is concluded that in composting under farm conditions, 0.4 lb. each of aluminum and ferrous sulphates should be added to each ton of compost, in order to obtain a maximum production of available phosphorus.

Calcium carbonate may bring about a decrease in available phosphorus when added to a sulphur-floats-soil compost. A compost was found to be more efficient in producing available phosphorus in the absence of large amounts of organic materials, such as peat, fresh horse manure, old composted manure, and peptone, the more soluble materials bringing about the greatest decrease in efficiency. It is suggested that sulfifying microorganisms may develop more rapidly in the absence of soluble organic matter, being similar in this respect

to the nitrifying organisms. When peptone was added to a mixture of soil, sulphur, and floats, the sulphur was largely transformed into sulphites.

A list of references including 76 titles is appended.

Sulfification in relation to nitrogen transformations, J. W. AMES and T. E. RICHMOND (*Soil Sci.*, 5 (1918), No. 4, pp. 311-321).—The authors present preliminary data pertaining to the relations observed between sulfification and the production of ammonia and nitrates in an acid and a basic soil under controlled conditions at the Ohio Experiment Station.

The soils employed included a silt loam deficient in lime and organic residues with a total lime requirement of about 4,000 parts of calcium carbonate per million; a black clay with a decided basic reaction, although it contained only 300 parts of calcium carbonate per million; and a thoroughly decomposed peat soil with a lime requirement of approximately 10,000 parts of calcium carbonate per million. Five 100-gm. portions of each soil were used, and additions made of flowers of sulphur, casein, rock phosphate, and calcium carbonate in varying combinations. Sufficient water was added to the mixtures to satisfy 60 per cent of their water-holding capacity, and the mixtures were transferred to quart jars which were placed in a darkened cabinet with the temperature maintained at from 28 to 30° C. Weighings were made every fourth day, and the water lost by evaporation was replaced. The mixtures were stirred two days after each addition of water. The experiment extended over a period of 17 weeks, and at the end of this time the amount of sulphur as sulphate, of nitric and ammoniacal nitrogen, and the acidity and the alkalinity in the water extracts of the various mixtures were determined. The extracts were prepared by adding a portion of each mixture representing 400 gm. of dry soil to 2,500 cc. of water, the extraction continuing through a period of 14 hours. The data are presented in tabular form and fully discussed, and the results may be summarized as follows:

The oxidation of elementary sulphur in soils devoid of base depresses the activities of nitrifying organisms. Although basicity was supplied by calcium carbonate in excess of the requirement of the soil, the yield of nitric nitrogen from casein was considerably decreased by the oxidation of added sulphur. A further decided depression occurred with decreased basicity, indicating that a quantitative relationship exists between the yields of nitrates and calcium carbonate additions. The increasing amounts of ammonia which accompanied the decreased yields of nitrates when sulphur was oxidized were not considered as indicative of sulfification having exerted a stimulating effect on ammonification. It is thought that this inverse relation between ammonia and nitrates must be interpreted as existing rather because the deficiency of base necessary for neutralizing sulphuric acid has inhibited the transition from ammonia to nitric nitrogen. The ammonia formed neutralized the acidity and remained as ammonium sulphate.

Commercial fertilizers, H. E. CURTIS, W. RODES, and O. S. LEE (*Kentucky Sta. Bul.* 214 (1917), pp. 337-438).—This bulletin reports the results of analyses of 784 different brands of commercial fertilizers registered during 1917.

The international trade in fertilizers and chemical products useful to agriculture, P. VAN HISENHOVEN (*Internat. Inst. Agr. [Rome], Internat. Crop Rpt. and Agr. Statis.*, 8 (1917), No. 9, pp. 733-786).—This review, dated September, 1917, gives the available data regarding world production, trade, prices, and consumption of fertilizers for the years 1913, 1914, 1915, and 1916, and for the first six months of 1915, 1916, and 1917. It shows especially the effect of the war on the trade in fertilizers.

The international movement of fertilizers and chemical products useful to agriculture, P. VAN HISSENHOVEN ET AL. (*Internat. Inst. Agr. [Rome], Internat. Movement Fert. and Chem. Prod. Agr.*, No. 8 (1918), pp. 86).—This review, dated May, 1918, gives the available data for 1913 to 1917, inclusive, regarding production, trade, prices, and consumption. The data regarding consumption are limited and all data for 1916 and 1917 are incomplete. "Information as to recent periods is mostly from private sources, while official data of production scarcely deal with later dates than 1913, 1914, and 1915."

Since the war began there has been a marked decrease in the production of phosphates and the prices have nearly doubled. "Though the fact is difficult to realize, the phosphatic production of the United States was affected by the war in a much greater degree, even before America took part in the conflict, than was the case in regard to the European colonies in North Africa. In fact, the American output fell off considerably between 1913 and 1916, from 3,161,146 tons in 1913 to 2,777,917 tons in 1914, to 1,865,123 tons in 1915. In 1916 production was slightly more extensive and reached 2,014,196 tons. . . .

"The production of Algeria varied from 461,030 tons in 1913 to 355,140 in 1914, to 225,871 in 1915, and then in 1916 there was a noticeable recovery to 380,211 tons. Likewise in Egypt there was a very decided recovery in 1916 with 125,008 tons, against 82,998 in 1915, 71,954 in 1914, and 104,450 tons in 1913.

"Finally, in Tunis an output of 2,284,678 tons in 1913, fell to 1,443,767 in 1914, to 1,389,074 in 1915, recovering slightly in 1916 to 1,695,000, though there is reason to believe that a fresh decline took place in 1917. . . .

"As regards the export trade in phosphates, the American shipments of rock phosphate fell off in 1917, being less than one-third of those in 1916, 9,491 tons against 32,423. . . .

"The total clearances of American phosphates, taking rock and land pebble together, were 671,620 tons in 1917, indicating a marked decline on 1916 with 710,738 tons. The exports from Tunis during 1917 were 625,885 tons. . . . This total is scarcely 60 per cent of the Tunisian exports in 1916 (1,034,736), and is less than one-third of the shipments during the last year of peace (1,984,880 tons in 1913)."

There has been a high production of basic slag since the war began, but it is of low grade. The English production in 1917 is estimated at 575,000 tons.

In general there has been a decided falling off in the production of superphosphate. However, in the first nine months of 1917 Spain produced 210,000 as against 315,000 tons in 1916, Great Britain 495,000 tons in 1917 as against 631,000 tons in 1916, and Italy 489,000 tons in 1917 as against 808,000 tons in 1916.

It is estimated that the French production of potash salts during 1917-18 will scarcely reach 5,000 tons, and the English output of potash from furnace dust will be about 15,000 tons. In the United States more potash was produced in the first six months of 1917 than in the whole of 1916, amounting to over 25,000 tons.

"Among the other sources of potash in the Old World, exclusive of the German salts of potash, we may mention the Spanish deposits of Catalonia not yet brought into use despite the efforts of the Government, and those on the frontier of Ethiopia and Erythrea, about 150 km. (93 miles) from the Red Sea."

The production of Chilean nitrate of soda in 1917 was 3,011,810 metric tons as against 2,914,542 tons in 1916. Since 1914 the stocks at the end of the year on the Chilean coast have never been so large as in 1917, amounting to 882,556 tons. Shipments in 1917 amounted to 2,787,392 tons as against 2,991,786 tons

in 1916. There was a largely increased consumption in the United States, amounting to 1,524,529 tons in 1917 as against 1,224,665 in 1916.

It is estimated that Great Britain produced 250,000 tons of sulphate of ammonia in 1917, France 34,000 tons, and the United States 400,000 tons. The German production in 1917 is estimated at about 700,000 tons.

It is estimated that the production of calcium cyanamid in 1917 was 866,000 tons, from works having a capacity of 1,321,000 tons.

AGRICULTURAL BOTANY.

Chlorophyll inheritance in maize, E. W. LINDSTROM (*New York Cornell Sta. Mem. 13* (1918), pp. 3-68, pls. 5).—The author gives the results of an investigation of the genetic interrelations between eight chlorophyll factors which have been determined in the genus *Zea* and their relation to other maize factors, such as aleurone color, etc.

It was found that the inheritance of eight chlorophyll types was strictly Mendelian. All are recessive to normal green, which contains the dominant allelomorphs of seven chlorophyll factors. Three of the types exhibited their chlorophyll abnormalities in the seedling stage, the other five being manifested only in the mature plant. Inheritance of the various factors, as well as linkage of factors, are discussed at some length.

Segregation phenomena in *Oenothera lamarckiana*, N. HERIBERT-NILSSON (*Lunds Univ. Arsskr., n. ser., Sect. 2, 12* (1915), No. 1, pp. 132, figs. 22).—The author reports on studies continuing his work previously noted (E. S. R., 28, p. 430), but employing larger numbers than heretofore of individual plants, which were carefully selected with respect to purity. His aim was to show that in *O. lamarckiana* splitting and recombination occur, and to ascertain what complications cause the apparent regularity of variability and the variations in segregation numbers.

A study of the only strictly qualitative factor exhibited by this plant, that for red veins, is considered to prove this to be a very simple case of so-called mutability. The conditions of heredity in case of this factor are said to be the same as those which in other plants and in animals are regarded as characterizing Mendelian heredity.

Experiments in the crossing of so-called mutations gave no uniform results. They can hardly be said to have resulted in the establishment of a distinct type. The peculiar phenomena of variability are considered to be explainable on the hypothesis of splitting and recombination.

The theory of apogamy was tested without obtaining a single case of apogamous descent out of more than 1,800 castrated flowers.

A large number of observations are detailed bearing upon the general problems of evolution and the formation of species.

Some novel experiments illustrating the response of plants to selective screening, H. E. RAWSON (*Trans. Hertfordshire Nat. Hist. Soc., 16* (1917), No. 4, pp. 259-268).—Experiments on several plants, of which *Tropæolum majus* was a conspicuous example, selected for exhibition and discussion resulted in the discovery that certain sports could be produced at will. Among these were peloria, median and axillary proliferation, petalody of anthers and sepals, synanthly, increase and staminody of petals, leaf division at will, and a series of correlated variations which are detailed. All of these changes have occurred repeatedly during the last ten years, and new varieties have been fixed.

Some plants were unable to live if deprived of sunlight at or very near a certain angle. Response to colored lights and the influence of the diffraction

bands caused by interference originating at margins, slits in leaves, etc., are also discussed.

Geotropism and phototropism in the absence of free oxygen, U. P. VAN AMELIDEN (*Rec. Trav. Bot. Néerland.*, 14 (1917), No. 3-4, pp. 149-217, pls. 5, fig. 1).—An account is given of experiments carried out on seedlings of *Avena sativa* and *Sinapis alba* with a stimulus of definite, known intensity under a constant pressure of one atmosphere.

The author found that seedlings which have been removed for a certain time from the influence of oxygen, when stimulated geotropically or phototropically, fail to react, and the same is true when they are exposed to air after deprivation of oxygen. A reaction occurs, however, if after being kept in an oxygen-free atmosphere the seedlings are stimulated in air and permitted to remain therein. The power of response weakens after prolonged periods of exposure to an atmosphere of low oxygen content. There are no indications that on complete or partial withdrawal of oxygen the reaction of seedlings to a geotropic stimulus differs from their reaction to a phototropic one.

Anatomical and physiological studies on the aquiferous vessels in plants, I. L. MONTEMARTINI (*Atti Ist. Bot. Univ. Pavia*, 2. ser., 15 (1918), pp. 109-134).—This is the first section of the work already noted (*E. S. R.*, 35, p. 224), the conclusions derived from this portion having been already indicated.

Studies on the thickness of rice seed coats, M. KONDŌ (*Ber. Ōhara Inst. Landw. Forsch.*, 1 (1917), No. 2, pp. 219-229, figs. 2).—It is stated that the seed coat thickness in rice varies, becoming less as ripeness advances. The outer layer is very thick during the milk stage and very thin when the seed are completely ripe. The inner layer, perisperm and aleurone taken together, is at first very thin, but when ripe it is very thick. When gathered at full ripeness, the seed contain more aleurone and fat. The total thickness differs with varieties. The better kinds of rice have smaller grains, but these are richer in fat and aleurone.

Stimulation of root growth in cuttings by treatment with chemical compounds, O. F. CURTIS (*New York Cornell Sta. Mem.* 14 (1918), pp. 75-138, figs. 8).—The author presents results of an investigation on the effect of various chemical compounds on the root growth of cuttings. Most of the experiments were carried on with the California privet (*Ligustrum ovalifolium*), although a number of other woody plants were tested.

It was found that treatments with potassium permanganate resulted in a marked increase in growth of various woody cuttings. Five possible explanations are suggested for this behavior. These are (1) that the treatment causes a change in the nature of the food supply of the twig, (2) that it affects the rest period of the cuttings, (3) that it upsets the balance of food supply in favor of the roots, (4) that it retards or inhibits growth of microorganisms, and (5) that it increases respiratory activity by catalytically hastening oxidation. The last of these explanations is considered most probable. Root growth is considered to be largely independent of the rest period, buds, but not the whole stem, assuming the resting condition. A number of other chemical solutions were found to show a slight stimulating effect at times, but in general nutrient solutions proved injurious to the root growth of the cuttings.

In a study of the effect of organic substances on cuttings, the author reports that immature twigs can be caused to absorb cane sugar and store it in such form as to be available as a food supply for increased root development. Mature twigs are but slightly benefited by treatment with cane sugar, or they may be somewhat injured. Any injury accompanying treatment with sugar

is considered not directly due to the sugar but to the resulting products formed by bacterial or fungus action.

A bibliography of literature is given.

Nutrition and reproduction in plants, III-VI, L. MONTEMARTINI (*Atti. Ist. Bot. Univ. Pavia*, 2. ser., 15 (1918), pp. 1-42, pls. 3).—The author completes this series, previously noted (E. S. R., 28, p. 224).

III. *Influence of external conditions on absorption and assimilation of various nutritive minerals in relation to reproduction.*—Having studied the relation of temperature to absorption of nitrogen, phosphorus, and phosphoric anhydride and the relation of absorption of the last-named compound to the formation of reproductive organs, the author states that the absorption of nitrogen and that of phosphorus by plants do not always maintain the same ratio, this being affected by external conditions. Temperature exerts different influences on different elements. Species also behave differently. The quantity of phosphorus absorbed varies independently of transpiration, but is closely related to illumination and appears to bear a relation to chlorophyll (assimilative) activity.

Temperature is an important determining factor, each species having its own temperature for the maximum utilization of phosphorus. This utilization diminishes more or less rapidly and regularly as temperatures rise or fall away from the maximum point.

IV. *Conditions favoring development of reproductive organs in nature.*—The production of reproductive organs does not require a determinate vegetative differentiation, but may be brought about by conditions internal or external to the plant. Vegetative differentiation, however, affects meristems, rendering them more or less ready to react to external agencies or combinations thereof in determinate ways.

For certain plants, in particular large trees, these conditioning external agencies are relatively fixed. For other plants they are variable, the first sort flowering regularly in one season only, the other at any season of the year.

V. *General conclusions.*—The general conclusions reached in this section of the main report are to the effect that the chemical composition in general predetermines the character (reproductive or vegetative) of the organs. Thus the initial stages of nutrition impress upon the protoplasm their tendencies, which are varied by external agencies.

VI. *Practical applications.*—The possibilities made apparent or suggested by these results present such number and complexity that numerous special investigations in different regions and under diverse conditions are deemed desirable.

The influence of magnesium on the formation of chlorophyll, EVA MAMELI (*Atti Ist. Bot. Univ. Pavia*, 2. ser., 15 (1918), pp. 151-205, pl. 1).—Briefer accounts of this work have been previously noted, as have also subsequent reports by the author (E. S. R., p. 435).

The origin and office of calcium oxalate in plants, I. POLITIS (*Atti Ist. Bot. Univ. Pavia*, 2. ser., 15 (1918), pp. 63-72).—The author concludes a discussion of the views expressed by several authors with the same statement which is made in a report previously noted (E. S. R., 27, p. 133).

Toxicity of monobasic phosphates toward soy beans grown in soil- and solution-cultures, J. W. SHIVE (*Soil Sci.*, 5 (1918), No. 2, pp. 87-122, figs. 5).—The author, having observed in the course of work previously noted (E. S. R., 36, p. 31; 39, p. 732) that certain phosphates added singly and even sparingly to the soil were toxic to soy beans, retarding development and causing specific

injury, has studied somewhat in detail the nature of this injury and the general effects of five monobasic phosphate salts on the growth of soy beans. The tests employed salt solutions singly in varying concentrations, in connection with a complete fertilizer ration added to the soil in mixed solutions with constant total concentrations, and in culture solutions with complete nutrient mixtures.

The extensive data here detailed are considered to show that the growth of soy bean tops is injuriously affected by each of the five phosphates used singly in soil cultures, each solution causing specific injury when having an osmotic concentration above 1 atmosphere. The order of their toxicity is indicated. The nature of the injury is the same for all, being related to the common group H_2PO_4 , or to the ions resulting from the dissociation of this group in the soil solution.

No specific injury resulted to plants in any soil culture of the 3-salt group employed. The relative proportion of the salts appears to be the significant factor. No definite relation was observed between injury and yield. Injury was more pronounced in the solution than in the soil cultures. The acid content of the solutions bears a definite relation to the specific injury sustained by the plants grown in them. The relative salt proportions, however, play a very important rôle in either accentuating or diminishing the injury when the acidity of the solutions is sufficiently high to produce such injury.

The effect of Bordeaux mixture on the rate of transpiration, B. M. DUGGAR and W. W. BONNS (*Ann. Missouri Bot. Gard.*, 5 (1918), No. 2, pp. 153-176, pl. 1).—The authors claim that previous reports (E. S. R., 30, p. 726; 31, p. 825) have shown that a film of Bordeaux mixture may increase transpiration of excised castor bean leaves and of potted tomato and potato plants, other films and even dust on the surface producing a less marked effect of the same kind. They have extended this study with elaborate precautions, which are described, for the elimination of error, and they now report that the results of previous work have been abundantly confirmed.

The material employed was of three kinds, namely, a mesophytic potted plant, a plant of xerophytic surface modifications (*Cyperus esculentus*), and the abscised leaves of castor beans. Plants of the first category showed increase mainly or entirely during the night intervals. This is discussed, as are also failures on the part of the other types to increase the transpiration rate when covered with a film of Bordeaux mixture.

Methods of pure culture study, H. J. CONN ET AL. (*Jour. Bact.*, 3 (1918), No. 2, pp. 115-128).—This is a preliminary report of the committee on the chart for identification of bacterial species, appointed by the Society of American Bacteriologists, and was prepared primarily to accompany the chart recommended at the 1917 meeting of the society for use in instruction in bacteriology. It was designed for provisional use during 1918, and thereafter to follow such changes as experience might show to be necessary. It deals with preparation of media, invigoration of cultures, morphological study, physiology, and cultural characteristics.

Studies in the nomenclature and classification of the bacteria.—V (Subdivisions and genera of the Spirillaceæ and Nitrobacteriaceæ, R. E. BUCHANAN (*Jour. Bact.*, 3 (1918), No. 2, pp. 175-181).—Three genera are described for each of these families, with reference to the literature of the subject (E. S. R., 39, p. 124).

FIELD CROPS.

[Standardization of field experiments] (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 3, pp. 402-419).—This is the report previously referred to (E. S. R., 37, p. 799) of the committee of the American Society of Agronomy on the standardiza-

tion of field experiments. The committee has directed its efforts toward the selection of certain phases of methods of field experimentation, reviewing experimental work related thereto and drawing such conclusions as it deemed justified, but withholding recommendations. The report is divided into three parts, namely: Size of Plats for Field Experiments with Crops, by W. M. Jardine; Size of Plats for Field Experiments with Soils, by T. L. Lyon; and The Use of Check Plats in Field Experiments, by A. T. Wiancko. The conclusions arrived at have been summarized as follows:

"The probable error for any one plat decreases as the size of the plat increases. For any given area devoted to a test of a single treatment the probable error is less if this area be divided into subareas and scattered over a field than if the treatment be applied to one single body of soil. Furthermore, the probable error appears to decrease with increased subdivision of the area down to very small units (possibly 0.001 acre). For the same reason, greater accuracy may be secured by using scattered treatments on small plats than by one treatment on a large plat even when the small plats do not cover as much land as does the large plat, but the ratios involved in this conclusion have not been definitely worked out.

"Experimental evidence appears to leave no doubt as to the possible accuracy of replicated row plantings as compared with single field plats when equal areas are used for each, and even when smaller areas are used for the row plantings, but here again no definite ratios are available.

"While there are very few data on the frequency of borings necessary to secure accuracy in sampling field plats, such data as are available indicate that it is difficult to secure an accurate sample and that borings should be taken at close intervals of space.

"Experiments in the use of check plats seem to indicate that the usefulness of these plats increases with the frequency with which they are distributed among the test plats. There are not sufficient data, however, to guide one in estimating how frequent their use should be in order to obtain any desired degree of accuracy."

A number of suggestions are advanced relative to the investigation of the whole subject of field plat trials, particularly the phase concerning the size of plats and the handling of check plats.

A bibliography of 78 titles is presented by way of a progress report.

Studies concerning the elimination of experimental error in comparative crop tests, T. A. KIESSELBACH (*Nebraska Sta. Research Bul. 13* (1918), pp. 3-95, figs. 23).—Supplementing work previously noted (E. S. R., 29, p. 38), the author describes rather extensive investigations conducted since 1911 in an effort to secure further information regarding the elimination of error in comparative crop yield tests. The principal features of the investigation embrace studies of error due to competition between adjacent plats, variation of stand as a source of error in yield tests with corn, relation of stand to yield in single-row test plats of corn, combination of rate planting and variety of yield tests with corn, effect of removing suckers with different varieties of corn, reliability of estimating plat yields by means of fractional areas, experimental errors caused by soil variation, significance of the probable error, effect of change in methods on agronomic equipment, measuring improvement in yield through breeding, soil limitation as a source of error in pot experiments, and observations on the methods employed in crop testing. The data are presented in tabular form and fully discussed. A bibliography is appended.

The results obtained and the conclusions reached may be summarized as follows: In determining the effect of competition between single-row test plats, the relative yields of two crops planted in blocks containing several rows were

regarded as the true relative values for the crops tested. In ascertaining some of these true values, the outer rows of the plats were discarded in order to eliminate almost entirely plat competition. Plats were sufficiently replicated to secure quite reliable relative yields for the conditions under which they were grown. In plat competition tests in 1913 with two rates of planting Turkey Red wheat, the thin rate yielded 68 per cent as much as the thick rate when grown in single alternating rows, while in five-row blocks the thin rate yielded 90 per cent as much as the thick rate. Competition in rows with a thicker rate of planting caused the thin rate to yield relatively 24.4 per cent too low, and in a similar test in 1914 the thin rate yielded relatively 56.8 per cent too low.

Competition between alternating rows of two rates of planting with Kherson oats caused the thin rate to yield relatively 20 per cent too low in 1913 and relatively 34.3 per cent too low in 1914. Competition between alternating single-row plats of Turkey Red wheat sown at two rates in 1914 reduced the relative number of stools per plant approximately 37 per cent for the thin rate. A similar reduction of 20 per cent for Kherson oats was observed, due to plat competition.

The relative competitive effect of varieties varied in different years, due to difference in adaptation to the seasonal conditions. In 1913, competition with Turkey Red winter wheat in single rows caused Big Frame winter wheat to yield relatively 10.3 per cent too high, while in similar competition in 1914 Big Frame yielded relatively 12.4 per cent too low. In 1913 practically no competitive effect was observed between alternating rows of Turkey Red and Nebraska No. 28 winter wheats, due to abnormal climatic conditions, while in 1914 under rather normal conditions, competition between single-row plats caused the Nebraska No. 28 to yield relatively 25.9 per cent too low. In 1913 in alternating single-row test plats of Burt and Kherson oats, the Burt yielded relatively 16 per cent too high and in 1914 relatively 37.6 per cent too high, due to plat competition. In 1913, competition with Kherson oats in alternating one-row plats caused Swedish Select oats to yield relatively 7 per cent too high, while in 1914 the yield was relatively 4.3 per cent too low.

When large and small seeds of wheat were planted in competition in the same row, the small seed yielded relatively 15 per cent too little grain, 20 per cent too little straw, and made 18 per cent too small total yield. Similar competition was observed between varieties of wheat planted in the same row.

In a single-row test of 80 strains of Turkey Red wheat grown in the same order each of four years, there were evidences of plat competition between strains. As an average for the four years, the poorest strain, No. 75, grew between strains No. 74 and No. 76, ranking one and five, respectively. A special test of these three strains in 1915 and 1916 indicated that strains No. 74 and No. 76 were favored 20 and 15 per cent, respectively, through competition with a less vigorous strain.

In a test with Nebraska White Prize corn in which two rates of planting, namely, two and four plants per hill, were compared in alternating single row plats, the thin rate because of plat competition yielded relatively 29.3 per cent too low in 1914, 9 per cent too low in 1915, and 16.1 per cent too low in 1916. Large, medium, and small varieties of corn represented by Hogue Yellow Dent, University No. 3, and Pride of the North, respectively, were grown in plat competition studies during 1912 and 1914. In 1912, Pride of the North yielded 85 per cent as much as Hogue Yellow Dent in alternating three-row plats and 66 per cent as much in alternating single rows. When compared in the same hill by the intrahill method, Pride of the North yielded only 47 per cent as much as Hogue Yellow Dent. Due to competition, Pride of the North yielded

relatively 44.7 per cent too low when compared in the same hill, and 22 per cent too low in alternating one-row plats. In 1914, Pride of the North yielded relatively 51 per cent too low when compared with Hogue Yellow Dent in the same hill, and in alternating single-row plats, 28.3 per cent too low. University No. 3 in comparison with Hogue Yellow Dent yielded relatively 8 per cent too low in single-row plats, and 1 per cent too high within the hill. Lack of competition within the hill may have been due to there being only two plants of a rather similar type in a hill. When all three varieties were compared in the same hill, the relative yields for Hogue Yellow Dent, University No. 3, and Pride of the North were respectively 100, 96, and 28, as compared with 100, 98, and 53 in the center row of three-row plats and 100, 98, and 38 in single rows.

In 1916, inbred Hogue Yellow Dent corn which had been greatly reduced in vigor by five years of self-fertilization was compared with the more vigorous first generation hybrid of two such pure lines in blocks, rows, and hills. Because of competition with the larger plants in the same hill, the inbred corn yielded relatively 44 per cent too low, while in alternating single rows it yielded relatively 16 per cent too low. Studies with oats, wheat, and corn suggested that the yield of the border rows of narrow adjacent test plats may be materially affected by plat competition.

Surrounded by corn hills having a full stand of three plants, two- and three-plant hills, respectively, yielded 10.5 and 35 per cent more than a one-plant hill in 1914. In a similar test in 1917 two- and three-plant hills yielded 67 and 102 per cent more, respectively, than a one-plant hill. The average grain yield of a three-plant corn hill surrounded by a full normal stand of three plants per hill was 465.8 gm. in 1914. This yield per hill was increased 2.7, 5.3, 13.1, and 43.1 per cent by the presence, respectively, of one adjacent hill with two plants, one adjacent hill with one plant, one adjacent blank hill, and two adjacent blank hills. In 1917 corresponding adjacent imperfect hills increased the grain yield of three-plant hills, otherwise surrounded by a full stand, 2, 9, 15, and 25 per cent, respectively.

Regarding three plants per hill as a perfect stand, the reduction in yield of corn was not proportional to a reduction in stand. With single-row plats, stands averaging 92.8, 87.2, 82.7, 77.8, 73.1, 66.6, and 43 per cent yielded, respectively, 85.5, 88.1, 83.5, 82.2, 77.9, 74.8, and 56.7 bu. per acre. Satisfactory yield corrections for corn based upon percentage of stand can not be made, because the effect upon yield depends upon the distribution of the missing plants and is not proportional to the percentage of stand. Comparable yield tests of similar varieties or strains of corn may be secured by basing the yield upon a counted number of hills containing a uniform number of plants and surrounded by a full stand.

Corn varieties or types differing markedly in growth characteristics should be tested at several rates of planting, because the optimum rate for one is not necessarily that for another. The removal of suckers is said to affect the yield of varieties differently, and for this reason suckers should not be removed in comparative variety tests.

In comparative yield tests where it is not convenient to harvest and thrash the entire plats, fairly reliable results may be obtained by harvesting and averaging a large number of systematically distributed small fractional areas or quadrates from each plat. The necessary number of quadrates to be representative will vary with the size of the plats. Twenty 32-in. quadrates harvested from 1/30-acre wheat plats gave fairly reliable results. Less than 20 proved likely to be unrepresentative of the plats. Very satisfactory results were obtained by having 40 quadrates represent 1/15 acre of wheat.

A uniform crop of Kherson oats was grown on 207 plats of $1/30$ acre each for the purpose of studying various phases of experimental error. When the odd and even numbered plats were regarded as check plats and test plats, respectively, and the grain yield of each test plat was corrected by the mean of the two adjacent check plats, the coefficient of variability for the actual yields of these test plats was reduced from 7.85 per cent for the actual yields to 7.01 per cent for the corrected yields. Assuming every third plat to be a check, and correcting the intervening plats by the one adjacent check plat, the coefficient of variability was reduced from 7.79 to 7.35 per cent. With every third plat regarded as a check plat and the intervening plats corrected progressively by the two nearest checks, the coefficient of variability was reduced from 7.87 to 6.57 per cent. Thus it is concluded that the yield of systematically distributed check plats can not be regarded as a reliable measure for correcting and establishing correct theoretical or normal yields for the intervening plats.

Systematic replication of plats is deemed to be the most effective and satisfactory means for reducing error caused by soil or other environmental variations. When 200 plats, $1/30$ acre each, were planted to a uniform crop of Kherson oats, the coefficients of variability for the grain yields of single plats and for the mean yields of 2, 4, and 8 plats were 6.3, 4.59, 2.91, and 2.13 per cent, respectively. The extreme variation between yields was also reduced from 20.7 bu. for single plats to 7.5 bu. for the means of eight plats. Reduction of error by averaging adjacent plats (equivalent to increasing the size of the plat) was far less effective than systematic replication. The coefficients of variability for single plats and for the mean yields of 2, 4, and 8 adjacent plats were 6.3, 5.46, 5.28, and 4.78 per cent, respectively. Variation between long, narrow plats was less marked than for short, wide plats of the same area, the coefficient of variability for $1/10$ -acre oats plats 48 rods by 5.5 ft. being 3.84 per cent, as compared with 5.18 per cent for plats 16 rods by 16.5 ft.

Two hundred uniformly planted $1/30$ -acre Kherson oats plats were arranged in 50 groups of 4 adjacent plats each and also in 50 groups of 4 systematically distributed plats, and the probable error calculated for the mean yield of each group of 4 plats. The results are held to indicate that a small probable error can not be regarded as sufficient reason for confidence in the reliability of data, since chance groupings of either large or small variations where relatively small numbers are used may lead to a mean being either more or less accurate than an application of the probable error would indicate. The limitations of the probable error are illustrated by the results obtained in small grain row tests and by experiments dealing with the water requirements of corn and wheat. It is concluded with regard to this point that "crop tests are subject to such a multitude of local environmental influences that errors in them can not be regarded as occurring according to the formulas or rules of chance calculated mathematically from purely mechanical observations. The probable error may apply where only accidental variations occur but not where systematic variations exist. Crop tests are subject to systematic variations. In view of the precautions necessary to guard against the invalidating influences of various sources of experimental error, greater and better facilities should be provided experiment stations for the conduct of crop investigations."

In crop breeding experiments improvement in yield over the original stock is said to be measured accurately only by growing some of the original unselected seed for comparison each year. The method of comparing the results of one period of years with those of another is deemed unreliable, as illustrated by Hogue Yellow Dent corn which, having undergone continuous ear-to-row breeding since 1902, yielded 39 per cent less during the seven-year period 1907 to 1913

than during the preceding seven years, while a seven-year comparison with the original seed which had been grown as a check indicated that the inherent yielding power of the ear-to-row and the original corn were almost identical.

Soil limitation may be a serious source of error in pot experiments. The relative total moisture-free yields for individual corn plants grown in pots of six sizes in 1914 were 100, 211, 324.1, 453.6, 643.8, and 747, and the corresponding yields of ear corn were 100, 632.5, 1,082.3, 2,417, 2,990, and 4,046.7. A uniform application of 1.75 lbs. sheep manure per plant (or per pot) increased the yields of total dry matter for the six sizes, in order from the smallest to the largest, 176.4, 95.3, 69.3, 26.1, 12.7, and 7.2 per cent, with corresponding increases in yield of 722.5, 193.6, 149.2, 18.9, 14.1, and 2.9 per cent. In 1915 the relative yields of total dry matter from the six sizes of pots were 100, 150, 229.6, 355.6, 586, and 578.7 per cent, and the corresponding relative yields were 100, 276.2, 819, 1,647.5, 2,771.3, and 2,667, respectively. Applying manure in amounts proportional to the quantity of soil contained had far less striking effect upon the pot yields for the different sizes in 1915 than when equal quantities were applied in 1914, regardless of the quantity of soil contained. When two, four, or six corn plants were grown in pots of the proper size for growing one normal corn plant, the individual plant yields of total dry matter were respectively 50.8, 26.7 and 16.6 per cent as large as for the one-rate, while the corresponding yields were, respectively, 39.7, 15.9, and 2.8 per cent as large.

A review of several hundred experiment station bulletins dealing with variety, fertilizer, cultural, and pot tests is held to indicate that the statement of methods employed in securing experimental data is often inadequate to acquaint the reader with the manner in which the results were obtained. Such a statement is deemed desirable in order that one may judge regarding the reliability of the results and the degree of confidence which the data merit.

The importance of plant breeding and experimental work in assuring the national food supply, N. H. NILSSON (*Sveriges Utsädesför. Tidskr.*, 27 (1917), No. 4, pp. 172-203, figs. 7).—This article represents a paper presented at a special meeting of the Swedish Seed Association, in which the value of the varieties of cereals originated during recent years in Sweden as related to the national food supply is discussed. The relative productive capacity of such varieties of winter wheat, spring wheat, winter rye, two-rowed barley, oats (including white and black varieties), and peas, as based on experimental results obtained at Svalöf, Linköping, Ultuna, and in other localities and as compared with results from common commercial sorts, is shown and the influence of these newer and better varieties on the total crop production of the country is pointed out. These results, which have been reported from time to time for each individual experiment, are here summarized to bring out their cumulative effect. In the Malmöhus district, where the varieties originated at Svalöf were most readily and widely distributed, the total wheat production approximately tripled in the 25-year period 1889-1913.

[Varietal nomenclature] (*Jour. Amer. Soc. Agron.*, 9 (1917), No. 9, pp. 419-427).—This is the report of the committee of the American Society of Agronomy on varietal nomenclature, previously noted (*E. S. R.*, 37, p. 799). The activities of the committee cover a period of six years, during which time much progress has been made in classifying the principal crop plants and adopting standard names. The report embraces a review of the work of other organizations, such as the American Pomological Society, the Peony Society, the Rose Society, etc., on the problems of nomenclature in their own fields, and proposes that certain definite action be taken by the American Society of Agronomy in regard to the nomenclature of field crops. The "Code of Nomenclature" proposed is included.

Field crop production, C. G. WILLIAMS, L. L. RUMMELL, and Z. P. METCALF (In *The Rural Efficiency Guide*. Cleveland, Ohio: The Peoples Efficiency Publishing Co., 1918, vol. 3, pp. 83-194, 206, 207, figs. 72).—This is a practical and comprehensive discussion of approved cultural methods and field practices employed in the production of corn, wheat, oats, barley, rye, buckwheat, cotton, tobacco, sugar beets, sugar cane, field beans, potatoes, alfalfa, clover, miscellaneous legumes, perennial and annual grasses, root crops, and related forage crops, based largely upon experimental work conducted in this country and Canada, together with actual farm experiences.

Methods for the control and eradication of the more common weeds are indicated and a table of troublesome weeds presented.

Rules for measuring feed, including small grains, corn, straw, hay, and silage and a seeding card for farm crops are given.

Intensive farming in India, J. KENNY (*Madras: Higginbothams Ltd., 1916, 2. ed., pp. VIII+611+XI*).—This is the second edition of a work previously noted (E. S. R., 32, p. 131).

[Work with field crops on the Huntley reclamation project experiment farm in 1917], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1917, pp. 1-7, 8-12, 14-16, 17, 18, 20, 21, 22, fig. 1*).—This reports the continuation of work previously noted (E. S. R., 38, p. 129).

Tabulated data are presented, giving a summary of climatological observations made at the Huntley experiment farm, Huntley, Mont., from 1911 to 1917, inclusive, and the acreage, yields, and farm values of crops produced on the Huntley reclamation project in 1917. There was an increase of slightly more than 500 acres in the total cropped area in 1917 over 1916, while the average farm value per acre of all crops advanced \$9.84.

In irrigated crop rotation experiments, the maximum yield of oats, 116.9 bu. per acre, was obtained after sugar beets; that of potatoes, 311.6 bu., after alfalfa; and that of sugar beets, 13 tons, after oats manured. This completed the sixth season for these experiments, and the results obtained may be summarized as follows: Alfalfa seeded in the fall in oat stubble produced more than when seeded the following spring, although this part of the experiments has been carried on only since 1916. The maximum production of alfalfa was usually reached during the second year. Sugar beets following a cultivated or a manured crop made the greatest yields. When grown after oats without manure the beets were usually small and the tonnage low. The importance of growing potatoes in rotation with alfalfa or a manured crop was indicated in the results secured each year. The highest yields of oats were usually obtained in rotations including alfalfa or a manured crop, while oats following oats or wheat proved undesirable. A larger average yield of wheat has been secured in the 2-year rotation with sugar beets. Wheat grown continuously for six years yielded an average of 30.8 bu. per acre, while on an adjoining plat, also seeded to wheat for six years, but having the straw returned each fall and plowed under, the average yield was 31.4 bu. per acre. The highest yields of corn were secured in rotations in which the corn followed alfalfa or a cultivated crop. The advantage of growing flax in rotation as compared with continuous cropping has been clearly demonstrated from year to year, the yield from the former for the past six years having been more than double that from the latter.

Tests of different methods for establishing irrigated pastures gave results similar to those obtained in 1916, and are held to indicate that the nurse-crop method of seeding is the most profitable, providing close attention is given to the water requirement of the grass rather than to that of the nurse crop. Spring seeding without a nurse crop is deemed the most certain means of ob-

taining a good pasture the second season, also furnishing some pasture during the latter part of the first season. The two mixtures containing clover out-yielded the mixture without clover.

Trials of various seeding methods and of different ways of handling red, alsike, and white clover for seed production led to the conclusion that, for the best results the first season after planting, white and alsike clover should be seeded without a nurse crop and the first crop left to make seed. Red clover started well with a nurse crop and made a good growth the following season, while the best results were obtained by clipping the first crop early and allowing the next crop to make seed.

In variety tests with corn for silage, Northwestern Dent produced 10.53 tons per acre, local Yellow Dent 8.47 tons, and Minnesota No. 13, 6.82 tons. Northwestern Dent also matured earlier than the other varieties. Mammoth Black Russian sunflowers were seeded in rows 40 in. apart, one half of the plants being thinned to 6 in. apart in the row and the remainder to 15 in. The crop was harvested for silage and yielded at the rate of 16.91 tons per acre for the plants thinned to 15 in. and 19.42 tons for those thinned to 6 in.

Applications of 300, 500, and 700 lbs. of acid phosphate per acre to different crops over a 5-year period failed to produce any significant differences in yields directly attributable to the influence of the fertilizer.

[Field crops] work of the San Antonio experiment farm in 1917, C. R. LETTER (U. S. Dept. Agr., Bur. Plant Indus., *Work San Antonio Expt. Farm, 1917*, pp. 1-20, fig. 1).—This reports the progress of work with corn, dwarf milo maize, oats for grain and hay, cotton, sorghum, Sudan grass, and flax continued along the same general lines as previously noted (E. S. R., 38, p. 430), embracing rotation, tillage, and variety tests. Agricultural conditions in the region are briefly discussed, including meteorological observations. The season of 1917 is said to have been very unfavorable for crop production.

In variety tests with beans for human food, Blackeye cowpeas appeared to be best suited for conditions of extreme drought, while tepary beans are said to have given promising results under similar conditions.

[Report of field crops work in St. Vincent, 1916-17], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1916-17*, pp. 5-7, 8, 9, 17-21, 22-25).—This reports the continuation of work along lines previously indicated (E. S. R., 37, p. 732). The results of fertilizer experiments with Sea Island cotton, described in detail elsewhere (E. S. R., 39, p. 637), are briefly noted for 1916-17.

The improvement of native corn through selection is said to be progressing favorably. Field tests with alfalfa, cowpeas, and miscellaneous forage crops are briefly noted. Tabulated statistics are presented and discussed relative to the production of cotton, arrowroot, and cassava for starch, sugar cane, corn, and peanuts in the island.

Phytotechnique studies and agricultural experiments in La Estanzuela, Uruguay, A. BOERGER (*Proc. 2. Pan Amer. Sci. Cong., 1915-16*, vol. 3, pp. 361-373, pls. 6, figs. 2).—This paper deals largely with plant breeding work in Uruguay, with special reference to the improvement of the cereal crops.

The laying-down of pastures, A. H. COCKAYNE (*Jour. Agr. [New Zeal.]*, 15 (1917), No. 5, pp. 241-247).—Briefly discussing abnormal conditions affecting the supply of grass and clover seed, the author outlines certain modifications of standard mixtures of grass and clover seed deemed suited for temporary, short rotation, long rotation, and permanent pastures, respectively, under New Zealand conditions. Mixtures are also recommended for "bush-burn" country of both good and poor quality. It is concluded that under present conditions grass seeding should be limited to the more temporary mixtures.

Comparative yields of spring and fall cereals, E. B. STOOKLEY (*Washington Sta., West. Wash. Sta., Mo. Bul. 6 (1918), No. 6, p. 87*).—A brief note is presented emphasizing the value of fall sown wheat and spring sown oats and barley on well-drained land in Washington. Average yields obtained in variety tests amounted to 31.91 bu. per acre for winter wheat as compared with 22.7 bu. for spring wheat, 34.83 bu. for spring barley as compared with 22.48 bu. for winter barley, and 56.41 bu. for spring oats as compared with 45.81 bu. for winter oats.

The chemical composition of green forage crops at different stages of development, H. G. SÖDERBAUM (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 3, pp. 185-201*).—Barley, oats, timothy, orchard grass, meadow fescue, field peas, vetch, beans, red clover, alsike clover, and alfalfa were studied as to their chemical composition at different stages of growth. The cereals and grasses were analyzed before the appearance of the spike or panicle, immediately after the appearance of the spike or panicle, at the blossoming stage, and at the time the grain or seed was beginning to form, while the leguminous plants were analyzed before blossoming, at the beginning of the blossoming stage, at the time of full bloom, and at the beginning of seed formation.

The results indicated that the dry matter in these crops increased regularly with their development. The dry matter content, especially toward the close of the growing period, was perceptibly higher in the grasses than in the leguminous plants. The nitrogen content, total nitrogen as well as albuminoid and amid nitrogen, was reduced more or less in relation to the dry matter content, but in such proportion that in relation to the weight of the green substance it remained constant or nearly so. As based on the dry matter the nitrogen content, especially toward the end of the vegetative period, was higher in the leguminous plants than in the grasses, but a similar difference did not appear when the nitrogen content was calculated on the green weight.

The cellulose content increased during the greater part of the growing period, and this increase was most regular in its relation to the green weight of the crops. The increase of cellulose in proportion to the dry matter was not arrested earlier in the grasses than in the leguminous plants. The grasses as compared with the leguminous plants were distinguished in general by a higher cellulose content.

The ash content of the plants diminished as growth progressed, but at a rate lower than that at which the dry matter content increased, so that the quantity of mineral matter based on the green substance increased slowly. The proportion of ash to dry matter was greater on the average in the leguminous plants than in the grasses. Among the leguminous plants studied, beans showed an exceptionally low content of dry matter, cellulose, and ash constituents.

Experiment on the manurial value of the tops of root crops, 1900-1907, K. IVERSEN (*Tidsskr. Planteavl, 24 (1917), No. 4, pp. 515-530, 616-618*).—The experiment reported was conducted with field beets, swedes, turnips, and potatoes, and the influence of plowing under the tops was observed in the two following crops, the first being barley and the second clover and grass.

The average yields of tops per hectare were as follows: Field beets 14,100 kg. (6.27 tons per acre), swedes 10,700 kg., and turnips 8,900 kg., representing respectively 30, 22, and 16 per cent of the total yields of roots and tops. The average yields of dry matter per hectare in the tops are reported as 2,000 kg. for field beets, 1,600 kg. for swedes, and 1,500 kg. for turnips. Basing the manurial value of the tops turned under on the fodder units represented by the increase in the total yields of barley and clover and grass, the relative figures are as follows: Field beets 100, swedes 153, turnips 177, and potatoes 23.

Some variable ears of dent corn, A. D. SHAMEL (*Jour. Heredity*, 9 (1918), No. 1, pp. 29-32, figs. 4).—The author presents illustrations of some interesting variations of white and yellow dent corn and briefly indicates the value to the plant breeder of describing and illustrating such variations.

Tropical varieties of maize, G. N. COLLINS (*Proc. 2. Pan Amer. Sci. Cong.*, 1915-16, vol. 3, pp. 579-584; *Jour. Heredity*, 9 (1918), No. 4, pp. 147-154, figs. 4).—The author briefly reviews a few of the more striking adaptations observed in corn varieties grown by the Hopi, Navajo, and Zuni Indians in the western United States and in *Zea mays* grown on the table-lands of Mexico. The necessity of looking for desirable adaptations rather than for desirable varieties is emphasized, and the conclusion is reached that "if a variety is growing under climatic conditions that are extreme in any particular, it is more than probable that the variety possesses valuable characteristics."

The new cotton fields of the Southwest, W. E. PACKARD (*Trans. Nat. Assoc. Cotton Manfrs.*, No. 102 (1917), pp. 140-162, figs. 5).—A general discussion of the present status and the future possibilities of cotton production in the irrigated valleys of the Southwest, with special reference to areas now under irrigation in the Imperial and Salt River Valleys and along the Colorado River in both California and Arizona.

[Report of the work of] the British Cotton Growing Association (*Brit. Cotton Growing Assoc. [Pub.]* 59 (1915), pp. 32, pl. 1; 62 (1916), pp. 35, pl. 1; 65 (1917), pp. 35, pl. 1).—Brief reports of the status of cotton production in British possessions for the years ended December 31, 1914, 1915, and 1916, respectively.

The improvement of cotton in India, II (*Bul. Imp. Inst. [So. Kensington]*, 15 (1917), No. 2, pp. 149-177).—Descriptions are given of samples of seed cotton grown in Madras, the Central Provinces and Berar, the Punjab, the Bombay Presidency, and the United Provinces and Burma, supplementing a similar compilation previously noted (*E. S. R.*, 29, p. 634).

Enneapogon mollis in Ascension Island, O. STAFF (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 6 (1917), pp. 217-219, pl. 1; *abs. in Nature [London]*, 100 (1917), No. 2508, p. 230).—The appearance of a grass identified as *E. mollis* on the lower parts of Ascension Island, South Atlantic, is reported for the first time. The grass, apparently an annual, is described as a native of tropical Africa, its introduction into the island being attributed to birds or winds. It made its appearance quite suddenly after the first rains experienced on the Island in many years. Live stock are said to relish it as a pasture grass, and hay of fair quality has been made from it.

The American system of flax and other fiber culture, A. W. THORNTON (*[Bellingham, Wash.]: Author, 1917, pp. 61, figs. 8*).—The author briefly reviews European systems of flax and hemp culture and recommends certain changes deemed necessary for their adaptation to conditions in the United States, especially in the Puget Sound region. Several uncultivated bast fibers are noted and the value of each indicated.

Flax culture in North Africa, M. J. DYBOWSKI (*Bul. Agr. Algérie, Tunisie, Maroc*, 23 (1917), No. 11, pp. 223-225).—A brief account of the status of the flax industry in the French colonies of North Africa.

Horse beans, R. MCKEE (*U. S. Dept. Agr., Farmers' Bul.* 969 (1918), pp. 12, figs. 5).—The field practices and cultural methods deemed best for growing the crop are described, and fungus diseases and insect enemies are noted. Horse beans are said to be valuable for forage, as green manure, and as a vegetable.

Report on the green forage production of different varieties of peas from 1907-1913, S. RHODIN (*K. Landtbr. Akad. Handl. och Tidskr.*, 56 (1917), No. 3, pp. 168-184).—The varieties of field peas compared in the experiment reported were Black, Svalöf Solo, Rättvik Gray, Jämtland Gray, Glenö, and Svalöf 0550. In 1909 the peas failed and the results of that year are therefore not taken into account.

Excluding Svalöf 0550, grown only for three years, the other five varieties gave an average yield of 28,429 kg. of green substance per hectare (12.65 tons per acre). The highest-yielding variety, Black, gave only 3.8 per cent of green substance above the average and the lowest-yielding sort, Jämtland Gray, only 1.6 per cent below it. In the production of dry matter Black and Svalöf Solo ranked highest.

The results of a chemical study of the different varieties are given in tables.

[Advantages of northern-grown and immature potato seed in Canada], W. T. MACOUN and C. A. ZAVITZ (*Agr. Gaz. Canada*, 4 (1917), No. 12, pp. 1039-1042, 1056, 1057, fig. 1).—Marked increases in yields of potatoes were obtained from northern-grown seed as compared with home-grown seed in the Province of Ontario. Immature seed proved to be superior to mature seed.

Potatoes: Acreage, production, foreign trade, supply, and consumption, G. K. HOLMES (*U. S. Dept. Agr. Bul.* 695 (1918), pp. 24).—This bulletin contains considerable statistical information regarding acreage, production, imports, supply, domestic exports, foreign trade surplus, and consumption of potatoes since 1849, with a summary for the ten-year period 1905 to 1914, inclusive. The information presented is deemed to be of interest to the public at large, as well as to those specially interested in potato production, trade, and consumption.

[Production and uses of rice] (*Bul. Imp. Inst. [So. Kensington]*, 11 (1913), No. 4, pp. 634-655; 12 (1914), No. 1, pp. 85-106; 15 (1917), No. 2, pp. 198-267; *abs. in Nature [London]*, 100 (1917), No. 2508, p. 231).—This is a comprehensive review of rice production throughout the world, with notes on insect and disease pests, the preparation of the crop for market, and the general tendencies of the trade.

Grain sorghum experiments in the Panhandle of Texas, C. R. BALL and B. E. ROTHGEB (*U. S. Dept. Agr. Bul.* 698 (1918), pp. 89, figs. 13).—This bulletin reports the results of extensive variety tests with grain sorghums conducted at Amarillo from 1908 to 1916, inclusive. Considerable data relative to climatic conditions prevailing in the region are presented and discussed. A classification of the grain sorghums into groups and of the groups into recognized varieties is outlined, and brief descriptive information is given relative to each sort. In addition to yield data, considerable agronomic data are presented showing the row space per plant and per stalk, the duration of the various stages of the growing period, the production of suckers, the percentage of erect heads in the milos, the height of the plants, and for certain varieties and in certain years the percentages, by weight, of heads in the total crop and of seed in the total crop and in the heads.

Dwarf milo, with an average yield of 27.1 bu. per acre, was highest, while milo, Alba milo, feterita, and Manchu kaoliang, with average yields ranging from about 21 to 23 bu., occupied second place in grain production. In the Kafir corn group, Dawn Kafir was first with an average yield of 18.8 bu. As combined grain and fodder crops, the Kafirs are said to have a higher value than any of the other grain sorghums.

From the results obtained in these experiments, the following conclusions are deemed warranted: Many varieties produced well in favorable seasons,

while only well-adapted varieties produced well in the less favorable and unfavorable seasons, which comprised about three-quarters of the total number. Earliness was the most important single factor, with dwarfness next in order, in the varietal adaptation of these crops to conditions obtaining in the region. The combination of earliness and dwarfness was extremely efficient in insuring adaptation to environmental conditions, which included frequent periods of drought. Dwarf milo, Dawn (dwarf) Kafir, and Sunrise (early) Kafir were found to be well-adapted varieties, the first two meeting with wide approval on the farms of the high, dry plains. Germination and stand were governed largely by local conditions at sowing time. Tillering and the production of erect heads were varietal or group characters to some extent, although in part correlated with stand and seasonal conditions.

Sugar cane experiments, 1915-1916, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 3, pp. 153-164).—In connection with work previously noted (E. S. R., 38, p. 537), this reports results of extensive variety tests with sugar cane, showing the yields of plant canes and first and second ratoons, and presents data on the composition of the juice.

The highest average yields of sucrose for plant and first ratoon canes for the two years amounted to 3.76 tons per acre for B. 1753, 3.54 tons for B. 208, and 3.36 tons for B. 156. Bourbon, the standard variety used in comparison, showed an average acre yield of sucrose of 2.13 tons.

Tops v. whole canes for planting, A. H. ROSENFELD (*Sugar [Chicago]*, 20 (1918), No. 1, pp. 9, 10).—Field experiments with sugar cane in a comparison of the tender tops, frequently discarded, with whole cane as seed were conducted at the Tucuman Sugar Experiment Station from 1911-1916, inclusive.

While slightly lower yields were obtained from cane cropped from the tops, in no case was the difference sufficient to pay for the additional seed required to plant with whole cane. It was deemed probable that if the upper third of the cane had been used still more favorable results would have been obtained.

[Sugar cane] (*Hawaii. Sugar Planters' Assoc., Rpt. Committee Cult. and Fert. Unirrig. Plantations*, 1917, pp. 34).—This reports as usual (E. S. R., 37, p. 444) points of special interest in the growing of sugar cane on unirrigated plantations in Hawaii, dealing with labor-saving methods in weed suppression, cultivation, etc., trash reserving, root disturbance, hilling up, stripping cane, and fertilizing.

Naming wheat varieties, C. R. BALL and J. A. CLARK (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 2, pp. 89-94).—This is a brief discussion of varietal nomenclature as applied to the wheat crop, presented by the senior author in connection with the report noted on page 833.

Date and rate of seeding wheat, C. G. WILLIAMS (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 9, pp. 267, 268, fig. 1).—In date-of-seeding tests conducted for 15 years in Wayne County, the highest average yield, 34.78 bu. per acre, was obtained from seedings made September 22, while in rate-of-seeding tests covering a period of 19 years, 8 pk. of seed with an average yield of 30.64 bu. is said to have been the most profitable rate. Similar tests in other sections of the State extending over shorter periods of time are also noted.

Combined date and rate of seeding tests were begun in 1916, in which September 25 has proved to be the best date and 10 pk. of seed slightly the most profitable rate.

Fertilizing the wheat crop in southwestern Ohio, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 9, pp. 269-271, figs. 2).—Recommendations are made for growing wheat on impoverished Clermont County soils. Manure, lime, and acid

phosphate, and in some cases nitrate of soda, are suggested under present conditions for wheat grown in various rotations.

The cost of growing wheat on typical nonirrigated areas in Montana, E. L. CURRIER (*Montana Sta. Bul. 122 (1918), pp. 142-161*).—Studies dealing with the business aspects of wheat growing on typical nonirrigated areas in the Gallatin Valley and the Judith Basin are described. The work was done chiefly during the seasons of 1915 and 1916, and comprised observations made on 83 farms in the Gallatin Valley and 122 farms in the Judith Basin. The data obtained are summarized in tabular form and fully discussed.

The area planted to wheat in the State has increased over 500 per cent since 1909, and the crop is said to be by far the most important in the areas studied. Farms in the Gallatin area have been under cultivation for about 30.9 years, while those in the Judith Basin area have been cultivated for only 8.8 years, necessitating considerably less labor in growing wheat than is required in the older region. In Gallatin Valley, wheat is generally alternated with summer fallow, and has produced on an average of 36.5 bu., while in the Judith Basin two crops of wheat, the second being "stubbled in," follow summer fallow, and the average yield has amounted to 23.4 bu. per acre.

Burning the straw was practiced by 87 per cent of the farmers in the Judith Basin area and by 73 per cent in the Gallatin area. This practice is regarded as very undesirable, the necessity of getting organic matter back into the soil being emphasized.

Plowing over 6 in. deep gave an average yield for all farms in both areas of 34.3 bu. per acre, as compared with yields of 29.9 bu. for a plowing depth of less than 5 in., 31.6 bu. for one of from 5 to 5.5 in., and 32.4 bu. for a depth of 6 in.

Observations on the cost of growing the crop in the two areas may be summarized as follows: The total cost of the field operations in growing and marketing wheat, including charges for man and horse labor and the use of equipment, was \$6 per acre in the Gallatin Valley and \$5.22 in the Judith Basin. The respective costs per bushel per mile for marketing wheat were 1.3 and 0.9 cts. The total cost of growing an acre of wheat, including rent of land, seed, etc., was found to be \$18.37 in the Gallatin Valley and \$15.83 in the Judith Basin. The estimated cost of growing an acre of wheat in Montana in 1918, based on current prices for labor and materials and normal yields, was \$20.33.

Tests and observations with wheat in 1917, J. DE VILMORIN (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 38, pp. 1077-1086; Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 2, pp. 35-41*).—Field tests conducted in the vicinity of Paris are briefly noted with different varieties of spring wheat seeded at 15-day intervals from March 1 to April 15, inclusive, with the number of days from date of seeding to harvesting indicated for each variety. Observations are also recorded on winterkilling in 1917 with 73 spring wheat varieties seeded in the fall of 1916.

[Studies with wheat at the Bezenchuk experiment station] (*Otchet Bezenchuk. Selsk. Khoz. Opytn. Sta., No. 5 (1914), pp. 123-177*).—Extensive investigations were undertaken to ascertain the effect of salt solutions of different concentrations upon the yield and composition of spring wheat. The salts used included sodium chlorid, sodium sulphate, sodium nitrate, ammonium chlorid, calcium chlorid, magnesium chlorid, ammonium nitrate, ammonium sulphate, magnesium sulphate, and dipotassium phosphate. The solutions were made up to concentrations representing normal, 2, 3, 4, 6, and, for the sodium salts, 8 atmospheres. It is stated that the influence of the solutions upon plant growth was first observed at the time of stooling, plants subjected to high concentrations being slow to stool out. Considerable tabulated data are presented.

Studies were also made of the effect of soil moisture variations upon the wheat plant during different periods of growth. It was concluded that changes in the amount of soil moisture in the early stages of growth, with like conditions prevailing in the later growth periods, had but slight effect upon the yield of grain with more marked effect upon the yield of straw. An increase or decrease of soil moisture during the period of heading greatly influenced the yield of grain, this period being deemed the most critical in the growth of the wheat plant. Variations in the soil moisture during the ripening period did not greatly affect the yield, but a decrease in moisture at this time increased the nitrogen content and decreased the weight of grain.

Conditions detrimental to seed production, J. B. S. NORTON and C. E. LEATHERS (*Maryland Sta. Bul.* 216 (1918), pp. 175-226).—The principal factors interfering with the development of seeds are rather fully discussed, embracing a review of much of the previous work on this subject and including the results of observations made by the authors. Diseases carried by the seed from one crop to another and troubles connected with pollination are dealt with in more detail than some of the other phases of the subject. General recommendations for growing good seed are outlined, and the problems encountered in a wide range of plants are taken up specifically for each crop, with particular reference to their control.

The authors summarize their own observations as follows: "Opportunity for farmers to save seed of many crops from their own fields and thus to secure locally adapted and disease-resistant strains is indicated.

"Tomato, cabbage, and other seeds will germinate and grow for a time under water and tomato seeds germinate in the fermenting tomato juice. Seeds of the horse nettle and perhaps others of the Solanaceæ are found germinating more frequently in manure than elsewhere.

"Seeds of a given species are much less variable in size than the plants that bear them.

"With the usual long period of blooming and superabundance of flowers, the ones killed by spraying trees when in bloom would not be missed. Some lots of cabbage chemically treated for disinfection, developed a growth of fungi which interfered with the growth of the seedling when germinated in sterile tubes on synthetic agar. The seedlings without the fungus grew freely. Cabbage seed were injured by water at 52° C. (125.6° F.) for 20 minutes and at 58° for 10 minutes. Older cabbage seed was injured at lower temperatures.

"Fresh, half-grown cowpeas will germinate. The resulting seedlings are slender and slow-growing.

"The largest and earliest blooming plants in colonies of winter cress are nearest the center where the mother plant of the previous year grew. Winter cress seedlings grown in the greenhouse did not complete their usual cycle, but remained in the vegetative condition all summer.

"McCormick is about the only potato variety that seeds freely here.

"There is enough variation in infection with *Septoria* on tomato seedlings to give promise of a leaf-blight-resistant selection. Seed from rotten tomatoes taken from the field often had a low percentage of germination. Seeds from tomatoes ripened in the laboratory and then allowed to rot germinate better. More hybrids will be included by selecting seed from the best plants in a tomato field where there has been opportunity for different varieties to cross. Easy methods for securing hybrid tomato seed are given. Tomatoes grown on excess of complete fertilizer and on dissolved South Carolina rock flowered earlier than those on other fertilizers, and on these and the ones on excess of potash there were somewhat fewer leaves below the first flowers. Seed from green tomatoes will germinate, but the greener the seed, the longer before

germination. Seeds from tomatoes immature when the leaves were killed by frost October 14 still germinated well when taken from the field up to November 9, withstanding a number of heavy frosts and with temperatures as low as 15° F. Five days' fermentation of tomato pulp did not affect the germination, but after that there was a rapid falling off in vitality. Tomato seed blackened by drying on copper screens were not lowered in vitality. Seed from which the embryo had begun to protrude, due to too slow drying, after full drying did not show any reduction in germination.

"The seeds of beechnut grown in this region are usually abortive. Broad beans scarcely ever set seed here. Opportunity to select early and full-berried strains of holly and strains of crucifers with less tendency to bloom too soon is indicated."

A list of publications cited, comprising 347 titles, is appended.

Results of seed tests for 1917, F. W. TAYLOR and F. S. PRINCE (*New Hampshire Sta. Bul. 186 (1917), pp. 3-19*).—This bulletin reports the results of the actual and guaranteed analyses in regard to both purity and germination of 103 official samples of agricultural seeds collected during the year ended September 1, 1917. Of the samples guaranteed for purity, 94 per cent were found to be up to or above the guaranty, and of those guaranteed for germination, 80 per cent were up to or above the guaranty.

The amended text of the New Hampshire Seed Law is included.

Results of seed inspection, 1917, J. P. HELYAR (*New Jersey Stat. Bul. 322 (1918), pp. 4-36*).—This bulletin presents tabulated data showing the results of the actual and the guaranteed analyses, with reference to both purity and germination, of 235 official samples of seed collected during 1917, including timothy; miscellaneous grasses; lawn grass mixtures; millet; red, crimson, and alsike clover; alfalfa; miscellaneous field crops; and vegetables.

Eradication of Bermuda grass, A. A. HANSEN (*U. S. Dept. Agr., Farmers' Bul. 945 (1918), pp. 11, figs. 2*).—Measures for eradicating Bermuda grass as a weed in intertilled crops in the Southern States are briefly described. Inability of the plant to withstand shade and susceptibility of the rootstock to winterkilling, said to comprise the principal natural weaknesses of the plant, are taken advantage of in its control. Alternating velvet beans or cowpeas, as a summer shade crop, with intertilled crops, such as corn and cotton, and the growing of oats or rye with or without vetch during the winter are said to be most widely and successfully practiced, especially in the Southwest. Exposure of the rootstocks by shallow plowing followed by persistent rooting by hogs has also given good results.

Squirrel tail grass or wild barley, L. H. PAMMEL (*Iowa Sta. Circ. 52 (1918), pp. 2, fig. 1*).—This gives a brief popular description of the weed, which is said to be very common in Iowa, interfering with crop production, injuring domestic animals, such as horses, cattle, and sheep, which feed upon it in the pasture, and serving as one of the common hosts of the stem rust of wheat. Plowing and harrowing infested fields are regarded as the most effective means of extermination.

[Some alien weeds of New South Wales, Victoria, and South Australia], H. W. ANDREW (*Jour. Dept. Agr. So. Aust., 21 (1917), No. 4, pp. 302-307*).—A tabular statement is presented giving the common and botanical names, origin, and relative importance of 56 alien weeds occurring in New South Wales or Victoria, and of 32 alien weeds more or less widely distributed in Victoria or New South Wales and recorded from one or more localities in South Australia.

HORTICULTURE.

Plant propagation in the Tropics, P. J. WESTER (*Philippine Bur. Agr. Bul.* 32 (1918), [Spanish Ed.], pp. 113, pls. 21, figs. 52).—A translation, with certain additions giving the work a wider scope, of the author's bulletin on this subject previously noted (*E. S. R.*, 35, p. 642).

Market gardening in the Southeast, South, and in northern Africa, W. CHENEVARD (*Culture Maraîchère et de Primeurs par Sud-Est, du Midi et de l'Afrique du Nord*. Paris: J. B. Baillière & Son, 1918, pp. 128, figs. 74).—A small handbook on vegetable growing in southern and southeastern France and in northern Africa, with special reference to the production of early vegetables for European markets.

Vegetable storage, F. E. MCCALL (*S. Dak. Col. Agr. Ext. Circ.* 9 (1918), pp. 12, figs. 8).—This circular discusses the factors favoring successful storage, and gives directions with illustrations for making various types of storage cellars and pits.

Using fertilizers in the greenhouse, S. N. GREEN (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 9, pp. 275-278, fig. 1).—This paper briefly summarizes the results of fertilizer experiments on eight crops of lettuce and on four crops of tomatoes and cucumbers.

Generally speaking a complete fertilizer gave good increases. The important fact brought out by the paper, however, is that acid phosphate, the only commercial fertilizer which at present can be procured at reasonable prices, when used alone gave a very consistent increase on the lettuce crops in every case, with the exception of a straw mulch plot where the conditions were such that phosphorus did not seem to be the limiting factor. The results were similar on the tomato crops with one exception where it is suggested that disease may have interfered with the results. With cucumbers the gain from acid phosphate was considerable.

The author presents a chart based on the average prices received for these crops showing the returns for each dollar invested in acid phosphate.

Specifications for containers for fruits and vegetables and loading rules (*Philadelphia: Fruit and Veg. Transportation Assoc., South and East*, 1918, pp. 31, figs. 42).—Specifications for containers are given for all of the commercially important fruits and vegetables, including plans and directions for loading carload shipments.

[Horticultural experiments at the San Antonio experiment farm in 1917], C. R. LETTEER (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm*, 1917, pp. 20-22, fig. 1).—A brief statement of progress made in cultural tests of fruits, nuts, and ornamentals.

The season of 1917 was very unfavorable for all fruit crops. A freeze on March 5, when the minimum temperature was 16° F., resulted in killing to the ground the figs, olives, pomegranates, and all citrus plants except citranges. The Rusk citrange tree was the least injured of the varieties of citranges, but the growing branches of this variety were killed back several inches and the fruit crop was practically destroyed. Many trees of all kinds died from causes resulting directly or indirectly from drought. The fruiting crops for the season consisted of some jujubes, two varieties of plums, a few figs, a seedling date palm, and *Pyrus betulaeifolia*, which species is being tested with reference to its value as a stock for apples and pears.

Report of the Pomological Committee of Australia for 1918, E. E. PESCCOTT (*Jour. Dept. Agr. Victoria*, 16 (1918), No. 7, pp. 434-444).—In addition to a brief

report of the general proceedings of the fifth meeting of the Pomological Committee, held at Adelaide, South Australia, in April, 1918, a list is given of seedling apples and pears to be considered at the next annual meeting, together with notes on previously approved seedling apples, pears, peaches, and plums; and a list of approved names of apples and pears to date.

Cost accounts on a fruit farm, J. WYLLIE (*Scot. Jour. Agr.*, 1 (1918), No. 3, pp. 301-306).—Some cost accounting data made on a fruit farm in western Scotland, during the three years 1915-1917, are presented.

Apple bud selection: Apple seedlings from selected trees, C. S. CRANDALL (*Illinois Sta. Bul.* 211 (1918), pp. 181-264, figs. 43).—In connection with apple breeding investigations started in 1907 a minor project in bud selection was undertaken to determine whether or not there are differences in value for the purposes of propagation between large buds and small buds, between buds produced on different parts of the tree, and between buds from different locations on the shoot. Another project undertaken at this time consisted in growing apple seedlings from fruits from trees chosen as possessing special merit. This bulletin brings together the records thus far made in connection with these projects, presents the methods pursued, and gives the status of the trees growing under each of the projects.

Summing up the data relative to size and position of buds used for propagating, it is concluded that there are no differences for this purpose between buds of large size and those of small size. Growth curves of trees propagated from buds from different situations on the trees so closely approximate as to indicate that it does not matter from what situation on the tree the buds are taken. All buds from healthy shoots are of equal value for purposes of propagation, at least so far as growth of trees is concerned.

There were decided and often extreme fluctuations in growth of individual trees within particular groups. In general, differences became less with increase in age, provided the trees remained healthy. No marked difference was observed in the growth of trees propagated from robust scions and those propagated from scions of small diameter. Studies of annual increments support and emphasize the fact of distinct individuality in the growth of trees.

The apple seedlings grown from fruit from selected trees have not come into bearing thus far. Observations and data secured relative to the growth of these seedlings, however, indicate that seedlings from seeds of large fruits are somewhat more resistant to adverse conditions and possess a higher degree of vitality than do seedlings from seeds of small fruits.

Hardy apples and plums for the Canadian Northwest, F. W. BRODERICK (*Minn. Hort.*, 46 (1918), No. 11, pp. 393-399, pl. 1, fig. 1).—This consists essentially of a brief review of the work of the Dominion Experimental Farms and individual horticulturists developing hardy apples and plums for the Canadian Northwest, both by introducing hardy stock and by crossbreeding. The more promising varieties resulting from this work are noted.

Preliminary report of pear harvesting and storage investigations in Rogue River Valley, C. I. LEWIS, J. R. MAGNESS, and C. C. CATE (*Oregon Sta. Bul.* 154 (1918), pp. 24).—In the investigations here reported fruit was gathered from eight different orchards representing different soil types and subject to different soil treatments. Fruit of six varieties was picked at intervals of four or five days throughout the season, the first picking being made slightly before the first commercial picking for each variety. The fruit was stored under the following different conditions: Common dry or ventilated storage, common humid storage, car temperature storage, cold dry storage, delayed storage, and cold humid storage. Samples were chosen from each lot for determinations

of specific gravity of juice, starch, sugars, acids, and moisture content. The results secured for the season of 1917 are reported in tabular form and fully discussed.

The investigations show that where it is possible to leave fruit on trees a short time longer than the average practice a very great increase in size of tonnage and in size of pack can be secured. Thinning the fruit by consecutive pickings does not exert any influence upon the size of the fruit remaining on the trees. The fruit on both thinned and unthinned trees will increase materially in size if allowed to remain on the tree until the end of the picking season. This increase in size is less marked with fruits from orchards suffering from lack of moisture.

The data secured showed that much of the fruit in the valley is picked too early to develop the best eating quality, although the early picked fruits keep better under common storage conditions. The eating quality of Bartlett's is not injured so much by early picking as that of late-keeping varieties, such as Clairgeau, Anjou, and Bosc. For all types of storage except common storage such as car temperature, cold, or cold humid storage, early picked fruit did not hold up as well as that picked somewhat later.

There seemed to be no correlation between size of fruit and keeping quality of pears picked from the same tree at the same time. Both large and small fruits ripened together and decayed together.

An attempt was made to see if a starch test could be used to indicate proper time of picking. The storage determinations as well as specific gravity determinations, however, show nothing at this time of value to orchardists. No direct correlation could be established between time of picking, keeping quality, or eating quality, and the analysis for sugar, moisture, and acid. Small poorly grown fruit contained slightly more sugar and in the case of Bartlett a very much higher acid content than large well-grown specimens.

The seedless raisin grapes, F. T. BIOLETTI (*California Sta. Bul.* 298 (1918), pp. 75-86).—This bulletin discusses two types of seedless raisin grapes, those commonly known as Sultana raisins and those commonly known as currants. Information is given relative to the extent of the industry in California, varieties, origin, culture, soil requirements, planting the vineyard, cost, and returns. Data are given showing the yields of a number of seedless vines under observation at the station's experiment vineyards.

Statistics on the production of grapes and wine in 1917 (*Estadística de la Producción Vitícola en el Año 1917. Madrid: Govt., 1917, pp. 7*).—A statistical report on the production of grapes and wines in various regions and Provinces of Spain during the year 1917.

Fruit culture in the Tropics, H. F. MACMILLAN (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 634-644*).—This paper deals especially with the present status of fruit culture in Ceylon and the possibility of developing an export fruit trade. Descriptive lists are given of fruits recommended for trial for low and intermediate elevations, with moderate rainfall; for the higher elevations (3,500 to 6,000 ft.); and for the dry or semidry zones. A list is also given of nuts suited to low elevations.

Citrus fruit improvement: A study of bud variation in the Marsh grapefruit, A. D. SHAMEL, L. B. SCOTT, and C. S. POMEROY (*U. S. Dept. Agr. Bul.* 697 (1918), pp. 112, pls. 11, figs. 14).—This is the third of a series of publications summarizing the citrus fruit-improvement investigations of this Department (*E. S. R.*, 39, pp. 447, 448).

The present paper describes in detail the study of bud variations in the Marsh grapefruit, as determined by means of individual tree performance records and observations. The history is given of the Marsh grapefruit, and

the objects and plan of the investigations, the methods of keeping performance records, and the important strains under study are described in detail. Notes are also given on infrequent fruit variations. Detailed tabular statements, together with the diagrams, are given of the annual performance of individual trees in two plats, one of 25 trees planted in 1898 and the other of 52 trees planted in 1903. These records cover the 6 years from 1910 to 1915, inclusive.

Bud variations in the trees of the Marsh variety of grapefruit are of frequent occurrence. Six strains have been found during these investigations up to the present time. The most valuable commercial fruits and those of the best quality are produced by trees of the Marsh strain, and this strain only is recommended for propagation for commercial purposes. Healthy trees of undesirable strains can be successfully top-worked by using select buds from trees of the Marsh strain. Only fruit-bearing wood should be used for propagation and it should be selected from the most productive and otherwise most desirable trees.

Citrus industry of California, L. W. BARTLETT (*Pomona Schools [Cal.] Bul. 12 (1918), pp. 28, pls. 2, figs. 19*).—A bulletin of information relative to various phases of the California citrus industry, prepared with special reference to its use by those seeking citrus culture as a vocation.

Cocoa (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 169-235*).—The following papers presented at the Third International Congress of Tropical Agriculture, held in London, in June, 1914, are included: The Qualities in Cacao Desired by Manufacturers, by N. P. Booth and A. W. Knapp (pp. 169-175); The Gold Coast Cocoa Industry, by W. S. D. Tudhope (pp. 176-188); Cocoa in the Southern Provinces and Colony of Nigeria, by W. H. Johnson (pp. 189-199); Notes on Cacao Cultivation Experiments, by P. Carmody (pp. 200-213); Cacao Culture in Mayumbe, Belgium Kongo, by J. Claessens (pp. 214-223); and Studies of the Cultivation of Cacao in Fernando Po, by E. Gómez Florez (pp. 224-235).

The rational culture of coffee in Central America, F. CHOUSSY (*Cultivo Racional del Cafe en Centro America. San Salvador, Salvador: Dir. Gen. Agr., 1917, pp. 92, figs. 12*).—A treatise on coffee culture with special reference to conditions in Salvador. The introductory chapter deals with the world's production, history, and botany of coffee. Succeeding chapters discuss climatic conditions in Salvador with special reference to coffee culture, selection of soils, preparation for planting, planting operations, pruning, fertilizers, cultural details, the diseases and pests of coffee, harvesting, yields, and returns.

The almond in California, R. H. TAYLOR (*California Sta. Bul. 297 (1918), pp. 3-72, figs. 28*).—An account of the almond with special reference to its production in California. The important phases discussed include the habits, climatic and soil requirements of the almond, districts especially adapted for almond culture, the selection of rootstocks, top-working of old trees, planting, culture, pruning, influence of culture on nuts, orchard heating for frost prevention, harvesting and preparing the crop for market, marketing, yields, cost of production, diseases, insects and other pests, varieties, and methods of classification with reference to hardness of shell. A bibliography of related literature is appended.

Garden calendar for Bermuda (*Bermuda Dept. Agr. [Pamphlet], [1918], pp. [5]*).—This pamphlet contains notes on the time of sowing, flowering, breeding, and culture of various annual flowers.

The use of wild plants in ornamental planting, A. LURIE (*Jour. Internat. Gard. Club, 2 (1918), No. 3, pp. 384-394, figs. 3*).—This comprises a select list of trees, shrubs, vines, and herbaceous perennials which abound in nature, are

showy, ornamental, and desirable from many points of view, and which it is believed should be used more freely in ornamental planting.

Landscape models for suburban properties and country estates, A. D. TAYLOR (*Jour. Internat. Gard. Club*, 2 (1918), No. 3, pp. 427-438, figs. 6).—A discussion of the use of small models in the development of landscape features, including illustrations of such models and suggestions relative to preparing them.

FORESTRY.

Comparison of seed testing in sand and in the Jacobsen germinator, J. A. LARSEN (*Jour. Forestry*, 16 (1918), No. 6, pp. 690-695).—The results are given of experiments conducted at the Priest River Experiment Station, Idaho, with the Jacobsen seed tester modeled after the one in use at the Danish Seed Control Station in Copenhagen. These results are compared with similar tests of the sand method of germinating, which method is generally used in testing seed at the Forest Service experiment stations.

Briefly summarized, the results prove that the Jacobsen germinator is more suitable than sand for scientific work and for ordinary seed testing. More uniform results are secured, the method can readily be duplicated and standardized, and the light, heat, and moisture conditions are better controlled and measured than is possible with sand tests. The condition of the seed may readily be observed at any time and seed may be removed at will for the purpose of physiological study. It gives the best results with rapid germinating species, but may be used to good advantage with the slower species, provided a satisfactory pre-germination treatment has been discovered.

Fungi as contributory causes of windfall in the Northwest, E. E. HUBERT (*Jour. Forestry*, 16 (1918), No. 6, pp. 696-714).—This paper considers all the factors concerned in the overthrow of trees by wind, presents evidence to show the extent to which fungi are responsible for windfall, and discusses other apparent relations between fungi and windfall timber. A bibliography of related literature is appended.

The relation between spring precipitation and height growth of western yellow-pine saplings in Arizona, G. A. PEARSON (*Jour. Forestry*, 16 (1918), No. 6, pp. 677-689, figs. 3).—Data secured from a study of the young growth of western yellow pine, conducted at the Fort Valley Experiment Station near Flagstaff, Ariz., led the author to conclude that April and May precipitation plays a very important rôle in the reproduction of the species. Two inches or more of precipitation at this time is several times as effective as the same amount in excess of the normal precipitation between December 1 and April 1. Factors reflecting atmospheric moisture conditions, including evaporation, wind movement, relative humidity, cloudiness, and length of rainless period, from April 1 to June 30, show a close, though not an entirely consistent, relation to height growth. Temperature on the sites studied appears to be important only in so far as it affects moisture conditions.

Rubber-manuring experiments, experiment station, Peradeniya, 1915-1917, M. K. BAMBER (*Dept. Agr. Ceylon Bul.* 36 (1918), pp. 12).—A progress report on manurial experiments started in 1913 (E. S. R., 34, p. 48).

The data for the four-year period 1914-1917 showed that with the exception of the phosphoric acid plat the total yield of dry rubber per tree was highest from the unmanured plat. The data for 1917 alone, however, showed a decreased yield, whereas plats receiving a general organic mixture and also those receiving an excess of nitrogen, phosphoric acid, and potash continued to show an increase in yield. This indicates that without suitable manuring rubber yields will not continue to improve after a certain stage.

The relationship between the anatomical structure of the cortex and the yield of *Hevea brasiliensis*, W. BOBILIOFF (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 7, pp. 488-517, pls. 2, figs. 19).—The present investigation deals especially with the distribution of stone cells in the cortex, the number of rows of latex vessels, the character of these rows, and the relative proportion of the soft part of the cortex, where stone cells are absent, to the hard part of the cortex where stone cells are abundant.

The number of rows of latex vessels in the soft part of the cortex shows a parallelism with the yield of *Hevea* trees. In good yielders the proportion of soft to hard cortex is generally greater than 0.5. In the bad yielders this proportion decreases considerably. In the renewed cortex almost the same number of rows of latex vessels are found as in the old cortex of the same tree. Exceptions to this rule are sometimes noted.

The author found that the number of rows, their character, and the proportion of soft to hard cortex, each considered separately, have no value as a criteria for the yield of a given tree; also the yield of individual trees is not an index to the nature of the structure of the cortex. Having determined the cortex structure, however, it is possible to place a tree in one of three groups of yielders, good, average, or bad.

Tapping and tapping experiments on the east coast of Sumatra, J. B. CORPORAAL (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 5, pp. 278-280; *Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser.*, No. 12 (1918), pp. 278-280).—A comparative test was made of the ordinary Jebong knife and the "Bosch" knife used in tapping rubber trees.

The data secured indicated that with the "Bosch" tapping knife a first-class tapper can be made to work 12.6 per cent and an average tapper 26.5 per cent more economically as regards bark consumption. The ordinary Jebong knife is better fitted for marking and for starting the first cut than the "Bosch" knife.

The influence of opening a tapping cut and of pollarding on latex and rubber, O. DE VRIES (*Arch. Rubbercult. Nederland. Indië*, 2 (1918), No. 5, pp. 241-255, fig. 1; *abs. in India-Rubber Jour.*, 56 (1918), No. 13, p. 11).—A group of 16 trees about 10 years of age, in the Buitenzorg Gardens, was brought into regular tapping on October 31, 1917. Both the latex and the rubber were studied for a period of six or seven weeks and a number of variations were observed. The variations in amount of latex, the rubber content of latex, the specific gravity of 15 per cent latex, as well as the tensile strength, standard time of cure, slope, and index of viscosity are here presented in tabular form and discussed. Similar data are also given for variations occurring in the latex and rubber after the trees were pollarded at a height of 9.84 ft. from the ground.

Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1916-17 (*Admin. Rpt. Forest Circles Bombay, 1916-17*, pp. 166+8).—This comprises the usual progress report relative to the administration and management of the State forests in the Northern, Central, Southern, and Sind Circles of the Bombay Presidency, including a financial statement for the year 1916-17. All important data relative to alterations in areas, forest surveys, working plans, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Report on forest administration in Burma, for the year ended June 30, 1917, C. G. ROGERS (*Rpt. Forest Admin. Burma, 1917*, pp. IV+109).—A report

similar to the above relative to the administration and management of the State forests in Burma.

Annual progress report on forest administration in Coorg for the year 1916-17, H. TREMAN (*Rpt. Forest Admin. Coorg, 1916-17*, pp. 2+14).—This statistical report, similar to the above, relates to the administration of the State forests in Coorg for the year 1916-17.

Oregon forest fire laws (*Salem, Oreg.: State, 1918*, pp. [2]+16).—This pamphlet gives the text of the forest fire laws enacted by the Legislative Assembly of Oregon during the period of 1911-1917.

DISEASES OF PLANTS.

Organization and correlation of research and extension work in plant pathology, W. A. ORTON (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 78).—The author indicates the necessity for work in plant pathology in connection with the conservation of food crops, and outlines a plan for the organization and correlation of this work.

The relation of phytopathologists to plant disease survey work, G. R. LYMAN (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 78, 79).—A description is given of the organization and plans of work of the plant disease survey undertaken by the United States Department of Agriculture, with suggestions for cooperative work on the part of station and other pathologists.

The plant diseases of importance in the transportation of fruits and vegetables, G. H. COONS and R. NELSON (*Amer. Railway Perish. Freight Assoc. Circ. 473-A* (1918), pp. 64, figs. 99).—This circular is a handbook of plant diseases which are important in relation to transportation, the three parts into which it is divided being, respectively, The Relation of Plant Diseases to Transportation, The Diseases Commonly Found in Shipments, and The General Principles of Successful Shipping. Within these parts are discussed the various diseases of fruits, precaution, and control measures in general.

Annual report of the microbiologist, 1916-17, S. F. ASHBY (*Ann. Rpt. Dept. Agr. Jamaica, 1917*, pp. 26-28).—Panama disease of bananas appears to be controlled by employment of frequent inspections and prescribed treatment. Only one case of bonnygate disease, or banana bulb rot, was recorded.

Coconut bud rot showed a marked increase in some sections following the hurricane of August, 1916. Leaf-bitten diseases or injuries were conspicuous along the whole north coast during the two years previous to that of the report. Of the four kinds mentioned, one is ascribed to the pineapple fungus (*Thielaviopsis paradoxa*), a second to a *Phytophthora*, a third to a yeast, and a fourth to a rhinoceros beetle (*Strategus* sp.). A leaf scar disease was associated with a fungus, probably a *Cytospora*.

Sugar cane chlorosis is apparently associated with the leaching of the soil.

Cacao pod rot (*P. faberi*) has been favored by the excessive rainfall. Spraying has proved profitable.

The so-called American disease of coffee (*Sphaerostilbe flavida*), a leaf, twig, and berry spot, was made prominent by the wet weather. The leaf spots due to *Cephaleuros mycoidea* were observed in one locality. Roots of dead coffee trees showed the presence of *Rosellinia* or of *Hymenochaete noxia*.

A dieback and death of pimento was associated with a black fungus identified in one case as *Rostrella coffea*, in another as a *Libertella*.

Grapevines were attacked by *Peronospora viticola*, *Oidium* sp., *Glæosporium ampelophagum*, *Guignardia bidwellii*, and *Uredo vitis*; pineapple by *Phytoph-*

thora sp.; sweet potato by *Albugo* sp., and by *Vasculomyces xanthosomae*; tomato by *P. infestans*; and grapefruit by a *Fusarium* and a *Bacterium*.

[Plant diseases, 1916-17], I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt. 1916-17*, pp. 55, 66-69).—Citrus canker, which was traced to one center, is thought to have been introduced on *Citrus trifoliata* stocks from Japan. Apparently it has not spread since the destruction of the nurseries found to be infected. Bacterial blight of pear blossom, causing loss in the Western Province of the Cape, is said to be distinct from the fire blight bacillus of the United States, also from that causing a similar blight in England. The infection is carried largely by bees. Blossom-end rot of tomatoes is of considerable importance in places. Certain varieties are found to be almost immune.

Fungus diseases of food crops in Ceylon, T. PETCH (*Trop. Agr. [Ceylon]*, 50 (1918), No. 3, pp. 159-163).—Brief descriptive notes are given of fungus and other diseases of food crops of India, with suggestions for their control so far as definite means are known.

[Diseases of economic plants in Queensland], H. TRYON (*Ann. Rpt. Dept. Agr. and Stock [Queensland]*, 1916-17, pp. 54-59).—A list is given of some of the plant diseases observed in various parts of Queensland during 1916-17.

Annual report of the Government microbiologist, H. M. NICHOLLS (*Tasmania Agr. and Stock Dept. Rpt. 1916-17*, pp. 20-23).—In addition to a discussion of injuries and losses from animals and other causes, it is stated that owing to the wet season fungus diseases of all kinds were common in fruit and other crops during the summer 1916-17. Black spot caused great loss in Tasmania and neighboring territory, and in some cases even more damage was done by powdery mildew or fire blight. The iron sulphid spray gave very good results in this connection. Apparently the same disease attacks the hawthorn. The black rot fungus (*Sphaeropsis malorum*) caused considerable injury to leaves and fruit of apple trees, killing the larger limbs in some cases. Plum rust (*Puccinia pruni*) was very common, causing much damage to stone fruits of all kinds, including apricots, which are seldom attacked in ordinary seasons. Shot-hole of stone fruit trees (*Coryneum beyerinckii*) was also common. Potato blight was almost universal throughout the State, practically ruining the crops in some districts. Field peas were attacked by several fungus diseases, among them the pea mildew (*Peronospora viciae*), a *Septoglenium* on the lower leaves and stem, and an *Alternaria*. Experimentation with control of these diseases was greatly impaired by the wet weather.

Factors influencing the uredospore germination of *Puccinia coronata*, L. W. DURRELL (*Abstr. in Phytopathology*, 8 (1918), No. 2, pp. 81, 82).—Some of the factors which influence the germination and growth of uredospores of *P. coronata* are indicated.

It was found that this rust would not germinate in atmospheres approaching the point of saturation, but that the spores must lie on a film of water to germinate. In a study of the temperature relations of the fungus, the minimum temperature for germination was found to be 0 to 2° C., the maximum 35°, and the optimum 18 to 22°. Spores placed out of doors in vials during January and February, 1917, were not viable after 10 days. Those exposed to 5° were reduced to 1.5 per cent germination in 30 days, and after 53 days all were dead. It is stated that rust spores increase in germinative capacity up to the third and fifth day after the appearance of pustules and after that time steadily decrease.

Recent studies on *Sclerotinia matthiolæ* n. sp., A. LENDNER (*Bul. Soc. Bot. Genève*, 2. ser., 9 (1917), No. 7-9, pp. 421-430, figs. 4).—The author has made a study of the organisms previously noted (E. S. R., 38, p. 850) in connection

with *S. matthiolæ* and *Botrytis cinerea* (conidial form of *S. fuckeliana*), following the complete life history of the organism which is definitely described as a new species under the name *S. matthiolæ*.

The best lime for Bordeaux mixture, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 17, pp. 394, 395).—The best lime for use in making Bordeaux mixture is the purest obtainable, still in the form of lumps, and little affected by the action of atmospheric carbon dioxide. Freshly prepared lime in powdered form is said to be comparable to the lump form for this purpose. Its degree of carbonation is also easily ascertained.

Lime magnesia (dolomite), which may be used in default of the forms recommended above, usually has a pure lime content of from 43 to 46 per cent. It is estimated that if the neutralization of 1 kg. copper sulphate requires 168.5 gm. pure lime, from 380 to 400 gm. dolomitic lime will be required for that purpose, and 500 gm. will be required to form an alkaline mixture.

Observations on copper sulphate sprays, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 15, pp. 341-345, figs. 3).—Methods and formulas are given, by the employment of which it is said to be very easy to obtain sprays of any desired reaction.

The addition of copper sulphate solution to milk of lime gives a precipitate which is at first too fine to be made evident except by use of ultramicroscopic methods. This precipitate is said to be chemically identical with that obtained by pouring milk of lime into copper sulphate, but extremely different as regards physical constitution, as the latter method gives, in place of the gelatinous mass characterizing the former, a large number of vesicles of various sizes, shapes, and apparent structures. These are often alkaline, while the liquid in which they occur is acid, this condition sometimes persisting long after complete desiccation on the leaves.

Seed treatment with hot solutions of formaldehyde and mercuric chlorid, I. E. MELHUS (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 81).—Data are given regarding the use of hot solutions of formaldehyde and mercuric chlorid from which it appears that dilute solutions of these fungicides, if used at temperatures of 48 to 50° C. for 5 minutes, were as effective in the control of potato scab as the stronger solutions and longer treatment. Similar results were obtained in the control of oat smut and barley stripe, the temperatures ranging from 45 to 60°. One minute was sufficient for the treatment with formaldehyde for oat smut, but mercuric chlorid used for the same length of time did not entirely eliminate this disease.

Smuts of small grains, W. L. BURLISON and G. H. DUNGAN (*Illinois Sta. Circ.* 228 (1918), pp. 7, figs. 5).—Directions are given for the soaking and sprinkling methods of formaldehyde treatment for stinking smut of wheat, covered smut of barley, and smut of oats; the so-called dry treatment of oats with formaldehyde; and the modified hot-water treatment for loose smut of wheat and barley. Notes are also given on wheat scab, corn smut, and rye ergot, with suggestions for their control.

Control of wheat and oat smuts, J. A. ELLIOTT (*Arkansas Sta. Circ.* 43 (1918), pp. 3).—A brief popular description is given of methods of seed treatment for the prevention of oat smuts, and the stinking smut and loose smut of wheat.

Barberries and black stem rust, H. R. O'BRIEN (*Northwest. Miller*, 114 (1918), No. 12, pp. 951, 952, figs. 5).—This is a brief account of the destructive 1916 outbreak and spread of black stem rust of wheat; the causal fungus; the barberry, which may serve as alternate host; and ways and means to eradicate the barberry as a control measure.

Three varieties of hard red winter wheat resistant to stem rust, L. E. MELCHERS and J. H. PARKER (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 79).—According to the authors, three varieties of hard red winter wheat have shown very little rust infection when subjected to severe rust conditions in a nursery at the Kansas Experiment Station. Other varieties showed a high degree of susceptibility, the percentage ranging from 40 to 98. Greenhouse experiments have still more firmly established the true resistance of these wheats, as they were the only ones out of 150 inoculated varieties that were not considerably infected.

Resistance and susceptibility of certain wheat varieties to loose smut, G. H. COONS and F. A. SPRAGG (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 69, 70).—Attention is called to the difference in percentage of loose smut in stands of wheat grown in the plant breeding plats of the Michigan Experiment Station.

Sclerotium rolfsii on wheat, G. H. GODFREY (*Phytopathology*, 8 (1918), No. 2, pp. 64–66, fig. 1).—The author reports having noted in the spring of 1915 blighted heads of wheat in certain parts of the South. Examination of fresh material disclosed a fungus which proved to be *S. rolfsii*.

Some Verticillium diseases, I. C. JAGGER and V. B. STEWART (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 75).—Verticillium diseases have been observed on potato, eggplant, barberry, salsify, and numerous species of *Solanum* growing in the vicinity of Rochester, N. Y. Cultures of Verticillium obtained from the various host plants are said to be indistinguishable in their characters and behavior. A fungus isolated from potatoes grown in Canada appears to be *V. alboatrum*, and the formation of sclerotium-like bodies on agar media is said to differ from the fungus so common on potatoes and other plants investigated by the author.

Relative susceptibility of beans to rust, F. D. FROMME (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 76).—From a study of some 50 horticultural varieties of beans, the author reports striking variations in susceptibility to attacks of bean rust (*Uromyces appendiculatus*). Some few varieties were found to be only slightly susceptible, and for all practical purposes these may be considered rust resistant. However, the majority are to be classed as susceptible and a few as very susceptible.

Experiments in root rot control, C. R. LETTER (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm*, 1917, pp. 22–24).—A report is given of experiments conducted in 1916 and 1917 to determine the effect of chemical treatment of soil on the prevention of root rot in cotton, commercial acid phosphate and calcium acid sulphate being used.

In 1916, plats were arranged in triplicate, and the chemicals were applied at the rate of 1,000 lbs. per acre. At the close of the season, observations showed that the treatments had no effect in reducing the extent of the root rot infection or on the yields of the crop. The same experiment was repeated in 1917, and no difference could be noted in extent of infection that could be attributed to the treatments. It was observed, however, that the acid phosphate treatment had apparently increased the yield of seed cotton to a slight degree.

In 1917, an effort was made to determine the depth to which root rot infection takes place, but a lack of rain resulted in such a limited growth that no conclusions could be drawn from this experiment.

A preliminary test of the effect of mulches on root rot of cotton was undertaken, but neither straw nor manure mulches had any effect on the development of the fungus.

Plats seeded to alfalfa were treated with acid phosphate to determine the effect on the root rot of alfalfa, but no beneficial results were observed.

Cucumber angular leaf spot and anthracnose overwintering and seed treatment control, M. W. GARDNER and W. W. GILBERT (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 79, 80).—Observations in cucumber fields in Wisconsin and Indiana are said to have shown that 90 per cent of the anthracnose cases were attributable to overwintering in the field, while only 25 per cent of the angular leaf spot cases could be traced to a previous crop.

In tests of seed treatment with mercuric chlorid 1:1,000, a marked reduction in the amount of both leaf spot and anthracnose was observed.

Mosaic diseases of cucurbits, I. C. JAGGER (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 74, 75).—Inoculations from cucumber plants affected with the two mosaic diseases previously reported (E. S. R., 37, p. 752) are briefly described. The author reports a large number of species and varieties of cucurbitaceous plants, as well as single species of the Lobeliaceæ and Compositæ, as affected with the white pickle mosaic disease, while relatively few species and varieties of Cucurbitaceæ became infected with the mottled leaf mosaic disease.

A mosaic disease of crookneck squash and pie pumpkin, distinct from the two diseases above, is reported to have been abundant in the vicinity of Rochester, N. Y., in the summer of 1917.

Further notes on cucumber mosaic disease, S. P. DOOLITTLE and W. W. GILBERT (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 77, 78).—In continuation of previous reports on the cucumber mosaic (E. S. R., 36, p. 349), the authors give an account of field experiments to determine whether the disease may be carried over winter in the seed. In only one instance out of 5,500 from seed of diseased vines was there any indication of mosaic.

The cause of mosaic is said to be still in doubt. It is believed to be readily transmitted by striped beetles and also by pickers harvesting the crop. Inoculation experiments have shown that cucumber mosaic may be communicated to 18 species in 10 genera of cucurbits.

Attempts to control this disease by sanitary measures combined with insect control have not given satisfactory results, nor have efforts to secure varieties of cucurbits resistant to mosaic been successful. The disease is said to be most serious at the present time in the pickle-growing sections of the Middle West.

The Botrytis blight of goldenseal, H. H. WHEITZEL (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 75, 76).—According to the author, this blight is the most common and destructive disease of *Hydrastis canadensis*. All parts of the host are affected, including the rootstocks. The pathogenicity of the fungus has been fully established by inoculation experiments, the parasite appearing to be restricted to the one host plant.

Spraying with Bordeaux mixture has not given complete protection against this pathogene.

A Fusarium disease of garden peas in Minnesota, G. R. BISBY (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 77).—An investigation is reported of a wilt disease of garden peas which occurred in Minnesota in 1916 and was again troublesome in 1917. Several species of Fusarium have been found associated with the disease, and the pathogenicity of one species has been repeatedly demonstrated. The species thus far has not been identified with any previously described form.

Potato spraying in Prince Edward Island, P. A. MURPHY (*Ann. Rpt. Dept. Agr. Prince Edward Island, 1917*, pp. 98-103, pl. 1).—This discussion, which also relates to poisons and their use in connection with the Colorado beetle, includes an account of a set of cooperative spraying experiments carried on during 1917, resulting in the practical elimination of late blight and an increased

yield of from 150 to 300 bu. per acre. Discussion is also given regarding the preparation and application of Bordeaux mixture.

Conidial formation in *Sphaeronema fimbriatum*, S. G. LEHMAN (*Mycologia*, 10 (1918), No. 3, pp. 155-163, pl. 1).—Having studied for two years the morphology and development of *S. fimbriatum*, the cause of sweet potato black rot, and more particularly the formation of the hyaline and the olive-brown conidia of this fungus, the author states that the process of conidia formation differs in certain particulars from that reported by Brierley (E. S. R., 35, p. 247). In the formation of the first conidium, the distal end of the protoplast of the conidiophore develops a new wall and separates as a conidium. This is liberated by the dissolution of the tip of the conidiophore, previous to which occurrence a second conidium may be formed. The first two conidia are regarded as endoconidia, but conidia subsequently formed are not regarded as endospores. The olive-brown conidia are not produced endosporously.

Storage rots of sweet potatoes, L. L. HARTER and J. L. WEIMER (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 73).—During an investigation that has covered about five years, 25 different organisms have been studied, 15 of which are said to produce rots under certain conditions. The most important and those most frequently met with are *Rhizopus nigricans*, *Sphaeronema fimbriatum*, *Sclerotium bataticola*, *Diaporthe batatatis*, and *Diplodia bataticola*. Other organisms which cause storage rots under special conditions are *Mucor racemosus*, *Alternaria* sp., *Botrytis cinerea*, *Penicillium* sp., *Epicoccum* sp., *Plenodomus destruens*, *Gibberella saubinetii*, *Fusarium incarnatum*, and *F. acuminatum*. A number of species of *Fusarium*, *Nectria*, and *Mucor* have been isolated from diseased potatoes but have persistently failed to produce decay when inoculated into healthy potatoes.

A surface storage rot of sweet potatoes, L. L. HARTER and J. L. WEIMER (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 73).—The authors state that a surface rot of sweet potatoes in storage, the infection seeming to take place about digging time, is becoming important in the northern section of the sweet potato belt. The development of the fungus in the infected areas is said to be slow, requiring from six to eight weeks to produce a spot $\frac{1}{2}$ in. in diameter. The spots are characterized by being shallow, somewhat sunken, brownish in color, and irregular in shape. From them a *Fusarium* has been isolated which is similar to, if not identical with, *F. hyperoxysporum*. The storage rot is said to be most prevalent and destructive when the potatoes are dug during a wet period and stored without properly drying.

Influence of soil temperature on *Thielavia* root rot, J. JOHNSON and R. E. HARTMAN (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 77).—Culture experiments have been made in the greenhouse to determine the temperature relations of *Thielavia*, the cause of tobacco root rot.

It was found that approximately 23 to 26° C. constitutes the critical temperature in the development of the fungus. At lower temperatures the disease became very pronounced, while above this temperature the amount of disease was reduced to a minimum or it did not occur at all.

Wilt disease of tobacco attributed to *Fusarium*, J. JOHNSON (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 76, 77).—A wilt disease of tobacco caused by a species of *Fusarium* is briefly described, and attention is called to differences existing between this wilt and that due to bacteria.

Delayed ripening of tomatoes caused by spraying with Bordeaux mixture, C. W. EDGEERTON (*Louisiana Stas. Bul.* 164 (1918), pp. 3-16, figs. 4; *abs. in Phytopathology*, 8 (1918), No. 2, p. 69).—According to the author two diseases of tomatoes, the early blight (*Alternaria solani*) and the leaf mold (*Cladosporium fulvum*), are prevalent in the tomato-growing sections of Louisiana,

where they often cause a partial, and sometimes a complete, defoliation of the plants. The early blight is said to appear in three degrees or conditions of severity: The disease may be confined to the lower leaves of the plant, causing their death, but not spreading to the upper leaves; it may spread from the lower to the upper leaves, but not to the fruit; or both leaves and fruit may be involved. To test the efficiency of spraying tomatoes for control of these diseases, experiments were carried on through three seasons.

It was found that while the diseases were readily controlled by spraying with Bordeaux mixture, the treatment was not always beneficial to the crop. The spraying caused a delay of from one or two weeks in ripening of the fruit, and this is considered a factor of great importance where tomatoes are grown for the early market. Spraying might or might not cause a greater total yield of fruit, depending upon the season and the seriousness of the infection. Delayed ripening is believed to be due to the greater vegetative growth of the plants. The presence of the diseases on unsprayed plants had somewhat the same effect as pruning.

As a result of these investigations, the author believes that when tomatoes are grown for early market the plants should be sprayed only enough to check the diseases during serious epidemics and that it is not advisable to try to control the diseases entirely.

Tomato selection for *Fusarium* resistance, C. E. DUREST (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 80).—The author reports on attempts to control *Fusarium* wilt of tomatoes in Illinois.

All experiments with soil fungicides resulted in failure. Selection experiments with a large number of varieties on infected soil showed wide differences in the amount of infection between different varieties and strains. From some of these strains improved stock has been produced which yields over twice as much marketable fruit as seedsmen's stock.

Fruit-tree cankers and their control, E. C. STAKMAN and A. G. NEWHALL (*Minn. State Ent. Circ.* 51 (1918), p. 8, figs. 5).—Among the kinds of cankers found in Minnesota, some of the most important are those due to winter injury, sun scald, or crown rot, fire blight, and black rot. Control measures include pruning, disinfection of pruning tools and the wounds made in pruning, and destruction of the diseased material.

Report on dust-spraying experiments, C. A. BINGHAM ET AL. (*Ann. Rpt. State Hort. Soc. Mich.*, 46 (1916), pp. 121, 122, pl. 1).—The committee appointed by the Michigan State Horticultural Society to observe some experiments on the use of dust fungicides on fruit as carried on in New York states that the results as a whole, while impressive and showing possibilities, were not entirely conclusive, owing apparently to abnormal conditions during the season in question.

Third progress report on investigations of leaf spot of cherries and plums in Wisconsin, G. W. KERR (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 72, 73).—An account is given of experiments for the control of leaf spot of cherries and plums, the investigation having been continued along the same lines as previously noted (*E. S. R.*, 37, p. 755).

Satisfactory commercial control was secured with Bordeaux mixture 3:3:50 and lime-sulphur 1:40. A treatment before the blossoms opened proved to be necessary. Orchard sanitation, which includes the turning under of fallen leaves as completely as possible before the blossoms open, proved valuable in the control of the disease.

Soft scald of apples and cherries, C. BROOKS and D. F. FISHER (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 68, 69).—The authors report that certain varieties of apples and cherries develop soft scald when inclosed for a short

time either in air or in an atmosphere composed partly or entirely of carbon dioxide. The injury increases with an increase in carbon dioxide or an increase in temperature. At 25 to 30° C., soft scald develops in 3 to 7 days, but at 15° there is little evidence of its presence at the end of 3 weeks. The disease is characterized by a decrease in the red color of the skin and a softening and browning of the flesh. With apples, especially with Jonathan and Rome Beauty, there is usually a sharp demarcation between the injured and sound flesh. Punctures, bruises, etc., seem to furnish points of entrance for the disease. A film of moisture over the fruit is said to favor the development of soft scald.

Crown-gall injury in the orchard, D. B. SWINGLE and H. E. MORRIS (*Montana Sta. Bul. 121 (1918), pp. 123-139, figs. 6*).—In order to determine the ultimate effect of crown gall on apple trees, an experiment was conducted in which 12 healthy and 12 diseased trees of each of 10 varieties were set in an orchard in May, 1910. The trees were thoroughly examined when planted, carefully set, and well cared for, and final notes were taken upon them in 1917.

At this time it was found that but few of the galls had disappeared entirely, while most of them were still growing, and some had increased very materially in size. The hairy root condition was very little in evidence and in most cases could scarcely be found. Careful observation showed some differences in the appearance of the healthy trees and that of the diseased trees, and the root systems of the diseased trees were plainly inferior. With exception of Northwestern Greening and Wealthy, there was a dwarfing of the trees on which crown gall was apparent, the average reduction in trunk circumference amounting to 1.58 in. The most striking fact brought out by the experiment was the greatly disturbed balance between the tops and the roots of the affected trees. The dwarfing is said to have been much greater in the roots than in the parts above ground, and the hairy root condition, in so far as it develops at the expense of strong anchor roots, is considered very important.

Apple powdery mildew and its control in the arid regions of the Pacific Northwest, D. F. FISHER (*U. S. Dept. Agr. Bul. 712 (1918), pp. 28, pls. 3, figs. 2*).—Apple powdery mildew, due to *Podosphaera leucotricha*, although widely distributed, is said to cause losses of 50 per cent or more in infected orchards of the arid regions of the Pacific Northwest. Experiments for the control of this disease in regions of this character have been carried on, and it was found that pruning could not be depended upon to control the disease when it occurs in epidemic form and that dormant sprays of lime-sulphur solutions have little or no effect on the overwintering of the fungus. It was found that the disease could be readily controlled by sulphur sprays during the growing season, but as sulphur is liable to result in spotting of the fruit under the conditions of high temperature from the bright sunshine of the interior regions of the Northwest, it was found that ammoniacal copper carbonate could be successfully used for the latter applications of fungicide. Experiments outlined indicate that two applications with lime-sulphur, one made when the blossoms are showing pink, the second made immediately after the petals fall and before the calyx is closed, and a third spraying with ammoniacal copper carbonate in three or four weeks give satisfactory control.

In the production of sulphur spotting of the fruit, high temperature from the burning sunshine is considered the determining factor. It is believed that injury is not due to toxic chemical action, but probably to the heating of the spray deposits to such a degree that death of the adjacent cells occurs, the results being partly due to the physical effects of the heat and partly to the chemical effects of volatilized sulphur compounds.

Air movement as a factor in the prevention of apple scald, C. BROOKS and J. S. COOLEY (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 69).—It is said that Grimes Golden apples stored at 15° C. (59° F.) in practically saturated atmospheres containing 1.5 to 5 per cent carbon dioxide became badly scalded when there was no air movement but remained free from scald when the air was kept in constant motion by means of air pumps. Other experiments are said to have indicated that air movement is a similarly important factor in influencing the appearance of scald at low temperatures.

Plum blotch, J. W. ROBERTS (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 74).—The author reports having found in Georgia a blotch of plums due to *Phyllosticta congesta*. This attacks the fruit, leaves, and probably the twigs of the Japanese varieties. The disease, especially on the fruit, is said to resemble greatly apple blotch due to *P. solitaria*.

Overwintering of the citrus canker organism in the bark tissue of hardy citrus hybrids, G. L. PELTIER and D. C. NEAL (*Jour. Agr. Research [U. S.]*, 14 (1918), No. 11, pp. 523, 524, pl. 1).—In a contribution from the Alabama Experiment Station, results are given of cooperative investigations between that station and the U. S. Department of Agriculture on the wintering over of the citrus canker organism.

In order to determine the resistance and susceptibility to citrus canker of some of the wild relatives and more common hybrids of the genus *Citrus*, inoculations were made in September, 1917. Although repeated observations were made during October and November, only the hardy *Poncirus trifoliata* and the grapefruit showed any evidence of canker infection. The plants were examined from time to time during the winter and no infection was found on the hybrids. In April positive evidence of citrus canker infection was observed on the Rusk and Savage citranges and on the citrandarin, the hybrid plants being heavily infected on their main stems and branches. The infection appeared simultaneously and extensively on all twigs, branches, and main stems of the plants, and this is believed to indicate that the citrus canker organism is able to withstand the winter conditions within the outer bark tissues of the host.

Citrus canker, W. NEWELL (*Mo. Bul. Cal. Com. Hort.*, 6 (1917), No. 7, pp. 263-268, pls. 3, figs. 7).—An outline is given of the outbreaks and spread of citrus canker in this country and of measures looking to its eradication as the only practical means of control.

[Coffee-leaf rust], J. C. ARTHUR (*Mycologia*, 10 (1918), No. 3, pp. 114, 115).—In this portion of an extended report, the author quotes several statements regarding the alleged presence of coffee-leaf rust (*Hemileia vastatrix*), which is claimed by him to be absent from all parts of the Western Hemisphere at this time.

A root rot of coffee due to a sterile mycelium, R. AVERNA-SACCÀ (*Bol. Agr. [São Paulo]*, 18. ser., No. 5 (1917), pp. 376-380, figs. 2).—An account is given of observations made in 1914 and in 1917 on a root rot of coffee trees which is briefly described. The causal fungus (sterile, so far as noted) suggested *Dematophora necatrix* or a *Dendrophoma*, though referable to neither of these fungi in the opinion of the author, who considers that it may prove to be identical with the fungus described by d'Herelle (*E. S. R.*, 22, p. 151) as a new species under the name *Phthora vastatrix*, and noted by him on various species of coffee in Guatemala.

Botrytis sp. causing severe injury to flowers and foliage of *Pelargonium hortorum*, L. E. MELCHERS (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 76).—The author reports having observed in October, 1916, severe damage caused to

geranium plants. The blooms were destroyed before attaining full development, and the leaves became infected from diseased portions of flowers falling upon them. Definite spots were produced on the leaves and frequently the entire leaf and petiole were involved. Investigation has shown that the disease is due to a species of *Botrytis* which is closely related to, if not identical with, *B. cinerea*.

The application of various sulphur dust compounds did not control the fungus. Rose canker and its control, P. J. ANDERSON (*Massachusetts Sta. Bul.* 183 (1918), pp. 10-46, pls. 3, figs. 11).—The results are given of some cooperative experiments on the methods of controlling the disease and of investigations in the life history of the causal fungus, which may have a direct bearing on control measures.

The disease, which is said to be a serious one on greenhouse roses, was previously described (E. S. R., 38, p. 854) as due to *Cylindrocladium scoparium*. In studying the life history of the fungus, the author found a second species of *Cylindrocladium* commonly associated with it. This differed mainly in the smaller size of the spores, and it is described as a new species under the name *C. parvum*. Inoculation experiments have been repeatedly made, and all the results indicate that the smaller form is a saprophyte, while the larger species is a parasitic organism.

In connection with control measures, the author has determined very practicable means, which include attention to the sanitation of the rose house, dipping the cuttings in Bordeaux mixture, sterilizing pots and potting soils, the use of raised benches and not ground beds, and sterilizing pots and tools.

The disease of tulips caused by *Botrytis parasitica*, E. F. HOPKINS (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 75).—An investigation reported by the author has shown that *B. parasitica* is well established on tulips brought to the United States. The pathogene is evidently a restricted parasite, which is believed to have been imported from Europe and which continues to be present on almost every shipment of tulip bulbs from that continent.

The white root fungus of cinchona, A. RANT (*Rec. Trav. Bot. Néerland.*, 14 (1917), No. 3-4, pp. 143-148, pl. 1, fig. 1).—In a previous communication (E. S. R., 37, p. 844), the author discussed two fungi, one of which, the gray root fungus, is said to have been later found (E. S. R., 37, p. 352) to produce *Graphium* as lower fructification. The other, the white root fungus, preferring trees of older growth, usually *Cinchona ledgeriana* and *C. robusta*, is said to be probably *Armillaria mellea* (possibly corresponding to the variety *javanica*).

A wilt disease of maples, L. A. ZIMM (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 80, 81).—In a previous publication (E. S. R., 33, p. 249) a disease of maples was described by Rankin as due to *Acrostalagmus* sp. The author thinks that the organism should be referred to the genus *Verticillium*, and he reports having isolated three strains of *Verticillium* from maples in different localities.

All of the strains are apparently different from *V. albovtrum* attacking the potato. Several trees representing three species of maple were inoculated and the typical wilt produced. *A. platanoides* was found to be most susceptible to the fungus.

Work on pine blister rust in Minnesota, 1917, F. L. WASHBURN (*Minn. State Ent. Circ.* 45 (1917), pp. 32, pls. 2, figs. 11).—The author summarizes features of the work for the previous year (E. S. R., 36, p. 652) and notes various activities and discoveries of 1917. A discussion of outlooks and plans, including the cooperation of the Bureau of Plant Industry, U. S. Department of Agriculture, for control of the white pine blister rust is included.

Piñon blister rust, G. G. HEDGCOCK, E. BETHEL, and N. R. HUNT (*Jour. Agr. Research* [U. S.], 14 (1918), No. 10, pp. 411-424, pls. 4, fig. 1).—In this contri-

bution from the Bureau of Plant Industry, it is reported that a species of *Cronartium* on *Ribes aureum* has been known in Colorado for many years and by some has been considered identical with *C. ribicola*, the cause of the white pine blister rust. A study has been made of this fungus, and the species native on *Ribes* spp. and *Grossularia* spp. in Colorado and Arizona has been found to be distinct and has been described as *C. occidentale* n. sp. The æcial stage of this fungus occurs on piñon pines (*Pinus edulis* and *P. monophylla*), and to this stage of the fungus the name *Peridermium occidentale* has been given.

The piñon blister rust is said to be widely spread throughout Colorado, extending into Arizona, and it is thought probable that further surveys will extend the known range of the species. The telial stage of the fungus occurs most commonly on *Ribes aureum*, but it is also occasionally found on *R. odoratum*, *R. inebrians*, and *Grossularia leptantha*, and it has been successfully inoculated on a number of other species. So far as known, only the piñon pines are attacked by *P. occidentale*. Based on circumstantial evidence, it is believed that the fungus is able to overwinter and maintain itself independent of the æcial stage.

Notes on *Cronartium cerebrum*, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology*, 8 (1918), No. 2, p. 74).—Inoculations made on pines with *C. cerebrum* from pedigree cultures from the fusiform type of the fungus (*Peridermium fusiforme*) and from the sphaeroid type (*P. cerebrum*) are said to indicate that the two forms of *Peridermium* belong to distinct races, if not to distinct species of the fungus.

Conditions of receptivity in *Pinus pinea* for *Sphaeropsis necatrix*, L. PETRI (*Ann. R. Ist. Sup. Forestale Naz. Firenze*, 2 (1916-17), pp. 449-463).—This is an account of conditions related to the occurrence and development of *S. necatrix* on *P. pinea* as studied since 1916 in portions of Italy. It deals with such factors as precipitation and soil composition or content, leading to the conclusion that the greater or less abundance of parenchymatous elements, the quantity of water in correspondence with the percentage of mineral elements present, and the stimulating action of manganese on the parasite are constitutional characters or conditions which determine susceptibility in the presence of appropriate climatic conditions. These constitute the chief external factor determining attack by *S. necatrix*.

Notes on some western Uredineæ, G. G. HEDGCOCK, E. BETHEL, and N. R. HUNT (*Abs. in Phytopathology*, 8 (1918), No. 2, pp. 73, 74).—According to the authors, the pycnia of *Peridermium pyriforme* are borne on areas of the bark of pines contiguous to the æcia and preceding them by a year, while the pycnia of *P. filamentosum* occur on the twigs and smaller limbs of pines on the more newly invaded areas, usually near the tips and ends and beyond the æcia. In case of both species, the pycnia usually appear at a date later than the æcia. *P. filamentosum* and *P. harknessi*, although having their uredinial and telial forms on Castilleja, are considered to be distinct forms of the same species, or, more probably, distinct species.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Wild life of the world, R. LYDEKKER (London: Frederick Warne & Co. [1915], vols. 1, pp. XIV+472, pls. 40, figs. 239; 2, pp. XII+440, pls. 39, figs. 218; 3, pp. XI+457, pls. 41, figs. 156).—The first volume deals with the animals of central Europe (pp. 5-382) and of northern, Alpine, eastern, and southern Europe (pp. 383-464); the second with those of Asia (pp. 1-238), the northern seas (pp. 239-312), and of America (pp. 313-426); and the third with animals

of Africa (pp. 1-206), Australia and Polynesia (pp. 207-298), and the southern and eastern oceans (pp. 299-394).

The rice rats of North America (genus *Oryzomys*), E. A. GOLDMAN (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 43* (1918), pp. 100, pls. 6, figs. 11).—This is a revision of the genus *Oryzomys*, all species of which genus are known as rice rats due to the fact that *O. palustris* was originally found in the rice fields of South Carolina and Georgia, though many inhabit regions where rice is not cultivated.

In the present work 51 forms of 21 species, representing the three subgenera *Oryzomys*, *Oligoryzomys*, and *Melanomys*, are recognized from continental North America, two of which (*O. melanotis colimensis* and *O. fulvescens mayensis*) are characterized for the first time. The general range of the genus is from New Jersey and the central part of the Mississippi Valley southward, the group being represented in nearly every part of South America and apparently reaching its greatest development there.

While the rice rats are not so injurious to agriculture as some other rodents, they consume in the aggregate large quantities of forage when, like cotton rats and meadow mice, they increase locally to excessive numbers. By reason of their small size and nocturnal habits these rodents largely escape observation and the economic importance resulting from their excessive numbers and wide distribution is not generally realized.

The control of mice in Virginia orchards, D. E. LANTZ (*Rpt. Va. State Hort. Soc.*, 22 (1917), pp. 155-161).

Squirrel eradication, W. C. JACOBSEN (*Mo. Bul. Cal. Com. Hort.*, 7 (1918), No. 3, pp. 149-156, figs. 3).

Winter birds about Washington, D. C., 1916-17, W. L. MCATEE, E. A. PREBLE, and A. WETMORE (*Wilson Bul.*, 29 (1917), No. 4, pp. 183-187).

Description of a new subspecies of the little yellow bittern from the Philippine Islands, A. WETMORE (*Proc. Biol. Soc. Wash.*, 31 (1918), pp. 83, 84).

The bobwhite, W. S. TAYLOR (*Univ. Tex. Bul.* 1748 (1917), pp. 26, figs. 7).—A popular account of the quail in which particular attention is given to its food habits, the benefits derived from its destruction of injurious insects being emphasized.

The common ravens of North America, H. C. OBERHOLSER (*Ohio Jour. Sci.*, 18 (1918), No. 6, pp. 213-225).—The author recognizes four forms, of which one, *Corvus corax europhilus* from the eastern United States and southeastern Canada, is described as new.

Bird enemies of tree hoppers (Membracidae), W. L. MCATEE (*Auk*, 35 (1918), No. 3, pp. 373, 374).—In the course of a review of that part of the work by Funkhouser previously noted (*E. S. R.*, 38, p. 462) relating to bird enemies of tree hoppers, the author calls attention to the fact that in investigations made by the Bureau of Biological Survey of the U. S. Department of Agriculture tree hoppers have been found in the stomachs of more than 120 species of birds and in numbers up to 26 individuals in a single stomach. "They have been found in 15 or more stomachs of each of the following species: Great-crested and ash-throated flycatchers, meadowlark, Brewer's blackbird, Bullock's oriole, English sparrow, cliff swallow, red-eyed, solitary, and warbling vireos, bush-tit, and ruby-crowned kinglet. The tree hoppers identified belong to 21 different genera, indicating that no partiality is shown. Membracids with the most prominent horns and spines of any in our fauna, as those of the genera *Campylenchia*, *Platycotis*, *Ceresa*, and *Platycentrus* are taken with the rest."

Report on insect [migration] investigation, S. C. BALL (*Carnegie Inst. Washington Yearbook*, 16 (1917), pp. 167-170).—This is a report of investiga-

tions of the forced migration of mosquitoes and other insects by the wind, made upon the Rebecca Shoal light station during the period from June 26 to July 18, 1917. This station is isolated in 12, ft. of water; 12 nautical miles east of the easternmost of the Tortugas Keys, the nearest land, 24 miles of open sea separating it from the Marquesas Atoll on the east. The nearest point on the mainland of Florida is Cape Sable, 105 miles to the northeast, and the nearest point on the Cuban coast is Habana, 95 miles south.

Commencing with July 1, when a single specimen was taken, the mosquitoes (*Culex*) *Ochlerotatus sollicitans* and (*C.*) *O. taniorhynchus* were collected at intervals, the former in much the larger numbers. Collections were made during intervals when the wind had been for many hours from the northeast and south, on which winds they must have been borne.

The author concludes that the mosquitoes are brought by the north winds from some point on the west coast of Florida, the direction of the wind having made it possible that some may have traveled 180 miles due south from Tampa Bay. Those arriving on the south and southeast winds must have come from some portion of the Cuban coast. Visits made to Loggerhead and East Keys, where no breeding places existed, showed *O. taniorhynchus* to be fairly abundant. In an untreated reservoir on Garden Key a considerable number of larvæ and pupæ of *Culex pipiens* was found. Many specimens of *Aedes calopus* were discovered on Loggerhead and East Keys which may possibly have been reared in cisterns.

In investigations at Rebecca Shoal forced migrations of the house fly were observed, 3 to 5 specimens being taken per day during a light east wind and as many as 25 on July 6 following a quick change of the wind from the north to east, indicating that they were brought from points eastward on the reef or possibly from the southern extremity of Florida. Along with the 37 mosquitoes, 18 house flies arrived from Cuba on July 11. A large strong-flying moth (*Syntomeida epilais*) arrived from Cuba on July 12. Other species collected were a green blowfly (*Lucilia* sp.) with an east wind; a tabanid with east wind; a small gnat, wind east-northeast; a dragonfly and a tabanid, wind east; 3 blowflies, 1 small fruit fly, and a *Chrysopa*, wind east; and 1 *Lucilia*, wind very light east. Three of five female *O. taniorhynchus* collected were allowed to suck blood and deposited eggs in a dish of fresh water three days after being inclosed in a cage on July 12. Attempts made on Loggerhead Keys to induce the house fly to breed in dead crabs failed, but the beachflies (*Sarothromyia femoralis* and *Sarcophagula occidua*) bred readily in such matter.

The great need for the establishment of competent bureaus for the study of injurious insects in all American countries, L. O. HOWARD (*Proc. 2. Pan Amer. Sci. Cong., 1915-16, vol. 3, pp. 874-876*).

[Economic insects and their control in Minnesota.] (*Minn. State Ent., 1917, Circs. 42, pp. 4, figs. 3; 44, pp. 14, pl. 1, figs. 7; 1918, Circs. 46, pp. 13, pl. 1, figs. 4; 47, pp. 14, figs. 22; 48, pp. 16, figs. 19; 49, pp. 7, figs. 6; 50, pp. 7, figs. 8*).—These several circulars relate to The White-Marked Tussock Moth, by A. G. Ruggles; Household Insects, by F. L. Washburn and C. W. Howard; The Hydrocyanic Acid Gas Treatment for the Flour Moth, by F. L. Washburn; Some Insects Injurious to the Potato, by S. A. Graham; Spraying, by A. G. Ruggles; and Insects of the Home Vegetable Garden and Insects Injurious to Small Fruits, both by S. A. Graham.

Some insect enemies of corn, W. WILLIAMSON (*Univ. Minn. Col. Agr. Ext. Div. Spec. Bul. 8 (1916), pp. 14, figs 11*).—A brief summary of information on the more important insect enemies of corn in Minnesota and means for their control.

Insects of the season (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 43 (1917), pp. 18-20).—Brief reference is made to the more important insect pests of 1917.

Notes regarding insect pests [in Tortola], C. H. BRANCH (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Tortola, 1916-17*, pp. 27, 28).—The large beetle *Butocera rubus*, reported as occurring in Tortola in 1913, at which time it was observed attacking the papaw trees growing at the experiment station and soon killed them, has since spread and now occurs in nearly all parts of the island. It has also been observed on Jost van Dyke and is recorded from St. Croix. The pest is now attacking the wild fig tree (*Ficus* sp.), which it is rapidly killing, and also the hog plum (*Spondias lutea*). It has been reported to attack the avocado pear, and a specimen has been collected from *F. elastica* growing at the experiment station.

The other pests mentioned include *Diaprepes abbreviatus doublieri*, which attacks the young parts of limes, bay plants, avocado pears, and many ornamental plants; *Alabama argillacea*, which was not abundant owing to the destruction of cotton in the gale of October 9; and the cotton stainer (*Dysdercus andreae*), which was less troublesome than in previous years.

[Indian insect pests] (*Rpt. Prog. Agr. India, 1916-17*, pp. 72-84, 87-89).—The more important Indian insects for the year 1916-17 included those affecting cotton, rice, sugar cane, tea, coffee, orchards, and gardens, stored grain, lantana, etc. Work with the silkworm and bees is also reported upon.

[Report on] entomological work, D. CLOUSTON (*Dept. Agr. Cent. Prov. and Berar [India] Rpt. 1916*, pp. 19, 20).—The work of the year dealt particularly with investigations of the life history of and control measures for the rice leaf-hopper (*Nephotettix bipunctatus*), a pest first observed in 1913.

The control and eradication of pests and diseases of stock and of crops (*Aust. Advisory Council Sci. and Indus., Rpt. Exec. Committee, 1917*, pp. 15-19).—This reports upon the status of work in Australia with the cattle tick; *Onchocerca gibsoni*, the cause of worm nodules in cattle; tuberculosis in stock; sparrows; and insects damaging grain in store, of which the granary and rice weevils, the grain moth (*Gelechia cerealella*), and the grain beetle (*Silvanus surinamensis*) are the most important.

Shuck protection for ear corn, C. H. KYLE (*U. S. Dept. Agr. Bul. 708 (1918)*, pp. 16, figs. 3).—This is a report of investigations conducted with a view to determining the merits of shucks or husks as a means of preventing insect damage to ear corn.

"Field investigations showed 43 per cent more weevil infestation in corn with poor shucks than in that having good shucks without wormholes. Storage investigations showed 93 per cent more weevil infestation in corn with poor shucks than in that with good shucks without wormholes. Laboratory investigations showed that weevils would starve rather than force their way through good shuck covering. These investigations showed 3 per cent more rotten, 16 per cent more discolored, and 18 per cent more worm-moldy ears in poor shucks than in good shucks.

"The so-called good shucks of these investigations were not ideal, but only better than the so-called poor shucks. The later investigations made it clear that the longer the shuck extension beyond the tips of the ears, the more effective is the protection against causes of damage, including earworms. This suggests the possibility of breeding a shuck extension long enough to be entirely effective against ear damage. Increased shuck protection need not increase the cost of shucking if proper use is made of shuck-shelling machinery.

"These investigations appear to justify the following recommendations: (1) Breed corn with a very long shuck extension that fits tightly about the silks. (2) To better protect ear corn in the fields from weevils, earworms, molds, and

discoloration, grow the best shuck-protected corn. (3) To make practicable the more general holding and feeding of corn on farms in the weevil-infested areas, store shuck-protected ears in their shucks and feed or sell the unprotected ears as early as possible."

The wheat insect survey of 1918, H. O. GOSSARD (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 9, pp. 259-266, figs. 2).—This is a report upon a field survey of wheat conditions made by the station, the extension service of the Ohio State University, and the State department of agriculture in 1918, in which 73 of 88 counties were explored.

The jointworm was found to be the most important wheat insect, having been responsible for a decrease of at least 10 per cent in the yield, amounting to \$8,000,000. The average infestation for the whole State was about 40 per cent. In northwestern counties parasitism ran high, in many fields 90 per cent of the jointworms being parasitized. There appear to be two species of jointworms at work in the State. Early seeding seems to lessen the injury.

The Hessian fly and the chinch bug were most numerous in the northwestern corner of the State. The wheat midge was next in importance to the jointworm, the damage as a whole amounting to 1 per cent or \$700,000.

Recommendations given for the control of these pests include a map giving the dates of wheat sowing as determined by the survey and long time experiments.

The control of three important wheat pests in Indiana, J. J. DAVIS (*Indiana Sta. Circ.* 82 (1918), pp. 11, figs. 6).—This is a summary of information on control measures for the jointworm, Hessian fly, and wheat midge, based upon work conducted in cooperation with the U. S. Department of Agriculture.

The tussock moth and other important shade tree insects, E. M. SCHLACK (*Trans. Ill. Hort. Soc.*, n. ser., 51 (1917), pp. 248-257).—A brief summary of information on the occurrence and control of these pests in northern Illinois.

Key to Orthoptera of Michigan with annotations, R. H. PETTIT and EUGENIA McDANIEL (*Michigan Sta. Spec. Bul.* 83 (1918), pp. 48, figs. 108).—Keys are given for the separation of the Michigan Blattellidae, Phasmodidae, Acrididae, Locustidae, and Gryllidae, and their genera and species occurring in Michigan. Generic descriptions are included.

The destructive South American locust in British Guiana, G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana*, 11 (1918), No. 1, pp. 3-10).—An account of the recent locust infestation and control work therewith.

Instructions for combating the locust by the use of *Coccobacillus acridiorum*, E. LOPEZ VALLEJO (*Instrucciones para Combatir la Plaga de Langostas por Medio de Cultivos del Coccobacillus acridiorum. Mexico: [Dir. Agr.], 1917, pp. 18, pl. 1, fig. 1*).—Directions are given for the use of this organism.

Locust control, R. RAMÍREZ (*Medidas contra la Plaga de la Langosta. Mexico: Dir. Agr.*, 1917, pp. 60).—A discussion of control measures for *Schistocerca americana*.

Test for control of the sugar-beet root louse, D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm*, 1917, pp. 19, 20).—This is a report of work commenced in 1914 and carried on in cooperation with the Montana Experiment Station (E. S. R., 33, p. 129), in which varying quantities of irrigation water were applied to sugar beets in order to determine whether a greater amount of water than is ordinarily used in irrigating beets would result in controlling the damage done by invasions of the sugar beet root louse. Papers relating to the subject by Parker have been previously noted (E. S. R., 33, p. 357.)

In 1917 two, three, four, and five irrigations were applied as follows: Two irrigations, August 1 and 30; three irrigations, July 26 and August 8 and 22;

four irrigations, July 12 and August 8, 14, and 28; and five irrigations, July 12 and 26 and August 1, 14, and 28. The yields obtained and other data on the tests are given in tabular form. These data show that in the first of the two fields irrigated the amount of infestation was less on the plats receiving the larger number of irrigations, although the yields did not vary consistently and the lowest yield was obtained from the plat that was irrigated five times. In the second field there was a consistent increase in yield and decrease in the amount of infestation as the number of irrigations was increased, the results in this field being similar to those secured in previous seasons. In all cases the sugar content was less in infested beets.

Blight-proof apple stocks and others, R. A. DAVIS (*So. African Fruit Grower*, 4 (1917), No. 6, pp. 105, 107, figs. 2).—It is pointed out that the Northern Spy is largely used as a stock in South Africa because of its immunity to woolly aphid attack.

A new menace: The black fly, W. NEWELL (*Fla. Grower*, 17 (1918), No. 21, pp. 5, 6, fig. 1; *Cal. Citrogr.*, 3 (1918), No. 9, pp. 209, 216, 217, fig. 1).—The author reports upon an investigation made in Cuba in October, 1917, of the occurrence of the spiny citrus white fly (*Aleurocanthus woglumi*), the adult of which is deep blue-gray in color while the larvæ and pupæ are jet black. In Cuba it is known as "mosca prieta," in Jamaica as the black fly, and in the Bahamas as the blue fly.

This pest, which has been known in Jamaica for seven or eight years, whence it appears to have been introduced from India, occurs in the Bahamas, and has recently been found by Morrison of the Federal Horticultural Board at both ends of the Panama Canal Zone, namely, at Colon, Cristobal, Ancon, and Balboa Heights. In Cuba it occurs in Guantanamo Valley (E. S. R., 37, p. 462) and about Habana, having now spread to every portion of Habana and its suburbs, with the exception of a few business blocks on the Prado (E. S. R., 38, p. 158). It is stated that the eggs, larvæ, and pupæ are abundant everywhere on lime and mango trees.

Continued spraying with kerosene emulsion has not resulted in even a temporary control of the pest and its spread is steadily continuing. Infestation is invariably accompanied by rapidly increasing scale infestations so that the life of an infested tree is necessarily short.

Representations made to the Cuban Government by the Florida State Plant Board in the belief that the subjugation of the pest in Cuba offers the best possible means of protecting Florida against invasion have resulted in renewed activity in control work, \$50,000 having been appropriated for this work by the Cuban Congress in November, 1917. Several inspectors of the Florida Board are aiding in this work. Inspection of the Florida Keys, commenced on January 15, is said to have been completed without detecting the occurrence of either canker or the spiny citrus white fly.

Combating lousiness among soldiers and civilians, G. H. F. NUTTALL (*Parasitology*, 10 (1918), No. 4, pp. 411-590, pls. 7, figs. 26).—This monograph deals with the subject under the headings of prevention, lousing by mechanical means, destruction of lice, plan of disinfection establishments, and modes of procedure, etc.

Cultivation of the mulberry and silk culture, H. GONZALEZ (*Breves Apuntes sobre el Cultivo de la Morera y la Cría del Gusano de Seda. Mexico: Sec. de Fomento*, 1917, 5. ed., pp. 70, pls. 29).—A popular guide to silk culture.

Report on the campaign against the brown-tail moth, L. S. McLATINE (*Rpt. Agr. New Brunswick*, 1917, pp. 55-61).—A report of field work carried on in New Brunswick during the winter of 1916-17.

Controlling the garden webworm in alfalfa fields, E. O. G. KELLY and T. S. WILSON (*U. S. Dept. Agr., Farmers' Bul. 944 (1918), pp. 7, figs. 4*).—*Loxostege similalis*, well known as an enemy of truck crops, has in recent years become a serious alfalfa pest, in some cases the second and third cuttings of the crop having been entirely destroyed. It has caused injury in the central western States, and there have been several serious outbreaks in Kansas and Oklahoma.

Control of this pest in alfalfa fields is best accomplished by properly timed cuttings of the several crops. When the alfalfa crop in an infested field has begun to get well into bloom or when the young shoots have begun to appear near the bases of the plants the cutting should be made as quickly as possible. Removal of hay at this time will cause large numbers of larvæ to perish through lack of food and exposure to heat and predacious enemies. Brush drags have been found valuable after the cutting of infested fields to insure the destruction of a greater number of larvæ. Since the larvæ feed on several kinds of weeds, clean cultural methods and weed destruction are necessary in ridding alfalfa fields of the pest.

Control of the green clover worm in alfalfa fields, C. C. HILL (*U. S. Dept. Agr., Farmers' Bul. 982 (1918), pp. 7, figs. 7*).—The author records widespread and severe infestations by *Plathypena scabra*, particularly in the vicinities of Wellington, Kans., Elk Point, S. Dak., Charleston, Mo., and in middle and eastern Tennessee, which classify this insect as a serious alfalfa pest. The caterpillar is nearly as voracious a feeder as the true alfalfa caterpillar (*Eurytus eurytheme*), and it is pointed out that should its natural enemies become reduced damage to alfalfa as serious as that done by *E. eurytheme* may be expected.

The green clover worm is generally distributed over the eastern half of the United States and southern Canada, usually confining its attacks to leguminous crops, such as alfalfa, clover, soy beans, cowpeas, and vetch. It also feeds readily on strawberry and blackberry plants and a number of common weeds. Timely cutting of the crop so as to remove their food supply when the caterpillars are most abundant, together with clean culture, is said to be the best control measure. This may be supplemented by the use of the hopperdozer when the outbreaks are particularly bad.

An account of this insect by Chittenden has been previously noted (E. S. R., 13, p. 665).

Codling moth control.—Results of dusting-spraying experiments, 1917, W. P. FLINT (*Trans. Ill. Hort. Soc., n. ser., 51 (1917), pp. 169-177*).—The work of the year with sprays and dusts in the control of orchard pests on a 10-acre block of Ben Davis apples near Plainview, Ill., is reported upon, but no definite conclusions are drawn as it is being continued in 1918.

Work in trapping the larvæ by means of tarred paper bands seems to show that tar paper is superior to any of the other materials commonly used for banding against the codling moth. The cost of paper for the bands was about 1 ct. per tree for trees 1 ft. in diameter.

Experiment with block trap for catching codling moth larvæ, P. A. GLENN (*Trans. Ill. Hort. Soc., n. ser., 51 (1917), pp. 180-185, fig. 1*).—The results obtained in the orchard indicate that either the block traps or tar paper bands materially reduce the number of larvæ of the second and third generations of codling moth seeking entrance into the apples. "The trap consists of two blocks of wood with felt between them, so arranged and fastened to the trunk of the tree that the larvæ when mature can crawl in between the two blocks to spin their cocoons. The advantage of this sort of trap over bands is in the fact that the larvæ can be destroyed much more expeditiously since all

the larvæ in the trap can be crushed, without removing the trap from the tree, by striking the outer block a sharp blow with a mallet."

Codling moth, C. P. LOUNSBURY and J. C. FAURE (*Union So. Africa, Dept. Agr. Local Ser. No. 22 (1918), pp. 24, figs. 10*).—A discussion of the codling moth and control measures applicable in South Africa.

Gracilaria zachrysa in New Jersey, H. B. WEISS (*Ent. News, 29 (1918), No. 3, p. 114*).—This tineid, previously recorded under the name *G. azaleæ*, as occurring on azaleas in New Jersey greenhouses (*E. S. R., 32, p. 450*), is now known to occur in many private greenhouses in various parts of the State, where it is somewhat of a pest.

The larvæ, which are about 0.25 in. in length, mine the leaves of azalea and also fold over the tips, and in some cases have been suspected of eating through the buds. In private greenhouses it is usually gotten rid of by hand picking of infested leaves. In one large commercial establishment arsenate of lead paste at the rate of 8 lbs. to 100 gals. of water is said to have given good results.

The spruce budworm, J. D. TOTHILL (*Ann. Rpt. Crown Land Dept. New Brunswick, 57 (1917), pp. 100-103, pls. 2*).—A brief report of investigations in New Brunswick, where the spruce budworm is the cause of considerable damage, particularly to balsam fir.

A preliminary catalogue of British Cecidomyiidae (Diptera), with special reference to the gall midges of the north of England, R. S. BAGNALL and J. W. H. HARRISON (*Trans. Ent. Soc. London, pt. 2-4 (1917), pp. 346-426*).—The first part of this catalogue consists of a classified list of 423 species; the second part of a check-list of the named species; the third part of an index to the host plants; and the fourth part is a bibliography.

Damage to fall wheat in Sweden in 1916 by the wheat midge (*Contarinia tritici*), Å. ÅKERMAN (*Sveriges Utsädesför. Tidskr., 27 (1917), No. 1, pp. 24-33; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 4, pp. 151, 152*).—A report of investigations conducted with a view to obtaining information on the extent of the injury caused to the different varieties of wheat by *C. tritici*. The loss caused during the year of comparatively severe infestation is estimated at about 5 per cent of the crop of the whole country.

The Hessian fly in California, C. M. PACKARD (*Mo. Bul. Cal. Com. Hort. 7 (1918), No. 4, pp. 174-177, fig. 1*).—A brief account of this pest as relates to California, with suggestions for its control.

[Proceedings of meetings] of the New Jersey Mosquito Extermination Association of the State of New Jersey (*Proc. N. J. Mosquito Extermin. Assoc., 1 (1914), pp. 92, pl. 1; 2 (1915), pp. 136, figs. 4; 3 (1916), pp. 159, pls. 7; 4 (1917), pp. 205, pls. 13, figs. 3*).—In the 1915 report a symposium on Important Mosquito Control Problems That Have Been Met and Their Solution, by members of the Mosquito Extermination Commission (pp. 14-66) is followed by papers on The Mosquito Work of the U. S. Department of Agriculture, by L. O. Howard (abstract) (pp. 67, 68); Economic Value of Mosquito Work, by J. G. Lipman (pp. 69-74); Relation of Antimosquito Work to the People of New Jersey, by W. E. Edge and T. Martin (pp. 75-80); Antimosquito Work from the Standpoint of the Taxpayer and Legislator, by B. H. Waldron (pp. 81-83); Malaria in New Jersey, by A. C. Hunt (pp. 84-95); Cost of Antimosquito Work, by T. J. Headlee (pp. 95-108); and The Mosquito Problem from the Standpoint of a Chosen Freeholder, by W. A. Evans (pp. 108-113).

In the 1916 report a symposium on Recent Advances in Mosquito Control Work (pp. 40-65) is followed by papers on The Place of Dikes and Tide Gates in Mosquito Control, by J. E. Brooks (pp. 8-18); The Place of Pumps in Mosquito Extermination, by W. Delaney (pp. 18-23); The Cost of Salt-Marsh Drainage for Mosquito Control, by H. Eaton (pp. 23-30); The Financial Side

of Mosquito Control, by R. W. Gies (pp. 30-40); Mosquitoes and Bats, by L. O. Howard (pp. 69-78); The Progress of Mosquito Control Work in New Jersey, by R. H. Hunt (pp. 78-86); Political and Economic Considerations in Mosquito Control Work, by J. G. Lipman (pp. 87-94); The Problem of Fresh Water Mosquito Control, by J. W. Dobbins (pp. 94-101); The Interstate Antimosquito Committee and Its Work, by H. Emerson (pp. 112-120); The Taxpayer's View of Mosquito Control, by E. M. Barradale, J. N. Cady, A. Gaskill, and E. S. Savage (pp. 121-129); and The Value of Experimental Study to the Practical Work of Mosquito Control, by T. J. Headlee (pp. 129-144).

The 1917 report includes in addition to a symposium on The Status of Mosquito Control Work (pp. 42-66) papers on The Present Status of Mosquito Control in New Jersey, by W. E. Darnall (pp. 3-9); The Circulation of Water on the Drained Salt Marshes—The Need For and the Way to Obtain It, by J. E. Brooks (pp. 10-17); The General Principles of Salt Marsh Drainage, by H. I. Eaton (pp. 18-24), a symposium on The Maintenance of Salt Marsh Drainage Systems, by W. Delaney, J. Dobbins, F. A. Reiley, H. G. Van Note, and S. Johnson (pp. 24-42); Tide Marsh Drainage in New Jersey, by C. C. Vermeule (pp. 67-80); The Malaria Problem of the South, by H. R. Carter (pp. 81-92); The Essential Steps in Controlling the Typhoid Fly and Its Associates, by L. O. Howard (pp. 92, 93); The Agricultural Utilization of the Salt Marsh, by J. G. Lipman, including remarks by A. Gaskill on the work of the Department of Conservation and Development (pp. 94-104); Essential Steps in Upland Mosquito Control in Both City and Country, by D. Young (pp. 121-127), in a large city, by W. Walden (pp. 128-135), and in village and open country, by W. V. Becker (pp. 135-143); The Place of Contract Work in Mosquito Control, by J. B. Leslie (pp. 143-152); Publicity Methods, by R. W. Gies (pp. 152-158); Mosquitoes and Malaria in Princeton, by U. Dahlgren (pp. 158-163); Mosquito Extermination in Greater New York, by E. Winship (pp. 163-172); Mosquito Control Work in Nassau County, L. I., N. Y., by C. C. Adams (pp. 172-184); Mosquito Control Work in Connecticut in 1916, by W. E. Britton (pp. 184-190); Mosquito Situation in Virginia, by W. J. Schoene (pp. 190-194); and The Meaning of Mosquito Extermination for the People of New Jersey, by R. H. Hunt (pp. 195-202).

The malaria problem in peace and war, F. L. HOFFMAN (*Newark, N. J.: Prudential Press, 1918, pp. 101*).—The first part of this paper (pp. 7-77) deals with modern eradication methods and results; the second part (pp. 79-101) with malaria in relation to war.

Field identification of malaria-carrying mosquitoes, E. A. SWEET (*Pub. Health Rpts. [U. S.] Sup. 32 (1918), pp. 8, figs. 19*).—An illustrated key for rapid identification.

Studies of agricultural biology.—IV, How can our planters and our colonists protect themselves against mosquitoes which transmit malaria? E. HEGH (*Etudes de Biologie Agricole: No. 4, Comment nos Planteurs et nos Colons Peuvent-ils se Protéger contre les Moustiques qui Transmettent des Maladies? London: Belgian Govt., 1918, pp. IV+200, pls. 24, figs. 63*).—An extended account dealing with the morphology and biology of, control measures for, and protection against mosquitoes. An extensive bibliography is included.

A second *Mycetophila* with dung-bearing larva (Diptera; Mycetophilidae), F. KNAB and R. H. VAN ZWALUWENBURG (*Ent. News, 29 (1918), No. 4, pp. 138-142, pl. 1*).—*Mycetophila merdigera*, the larva of which was first found in Porto Rico in October, 1916, near Aibonito on the leaves of guamá (*Inga laurina*), and later in June, 1917, in considerable numbers on the under surfaces of the leaves of *Eugenia jambosa* near Mayaguez, is here described as new.

The zoocecidia of northeastern United States and eastern Canada, B. W. WELLS (*Bot. Gaz.*, 65 (1918), No. 6, pp. 535-542).—This is a summary based upon a completed descriptive account of the zoocecidia of northeastern United States and eastern Canada said to contain descriptions of 792 nematode, mite, and insect galls.

Contribution to a monograph of the Tendipedidæ of the Canary Islands, E. SANTOS ABREU (*Mem. R. Acad. Cien. y Artes Barcelona*, 3. ser., 14 (1918), No. 2, pp. 170, pl. 1).—A systematic account of the group of chironomids represented by the subfamilies Tendipedidinae, Pelopiinae, and Heleainae.

Observations on the nymphs of *Coccinella septempunctata* parasitized by *Phora fasciata* in France, H. DU BUYSSON (*Bul. Soc. Ent. France*, No. 15 (1917), pp. 249, 250).—The author records the rearing of *P. fasciata* from this ladybird beetle in the Department of Allier, France, in July, thus confirming the earlier record of Rondani.¹

Notes on the hibernating of the belted cucumber beetle, R. A. SELL (*Ent. News*, 29 (1918), No. 3, pp. 93-99).—This is a report of observations made of *Diabrotica balteata* in the vicinity of Houston, Tex., during 1916-17.

The beetles were found to enter the ground from December 4 to 12, inclusive, and to reappear from February 21 to March 6, inclusive, 71 days being the shortest and 92 the longest period that the beetles remained underground. They are said to show a decided preference for going down along the roots of biennials, the coffee bean being a favorite plant for their winter quarters.

The green muscardine fungus in Porto Rico (*Metarrhizium anisopliae*), J. A. STEVENSON (*Jour. Dept. Agr. P. R.*, 2 (1918), No. 1, pp. 19-32, figs. 3).—Investigations indicate that this fungus will not serve as a practical means of controlling the white grubs in Porto Rico. A list is given of 17 hosts previously recorded, in addition to which the author adds 12 observed in Porto Rico. A list of 43 references to the literature is appended.

Control of the round-headed apple-tree borer, G. G. BECKER (*Arkansas Sta. Circ.* 42 (1918), pp. 4, figs. 3).—A popular summary based upon the study previously reported (*E. S. R.*, 39, p. 663).

The cane beetle borer in Australia, R. VEITCH (*Colon. Sugar Refin. Co. [Fiji], Agr. Rpt.* 3 (1917), pp. 14, pl. 1).—A report of studies of *Rhabdocnemis obscura* and means for its control, together with notes on the cane moth borer.

The *Phoracantha* beetle.—A borer pest of eucalyptus trees, C. P. LOUNSBURY (*Union So. Africa, Dept. Agr. Local Ser. No. 24* [1918], pp. 10, pls. 2).—An account of *Phoracantha semipunctata*, a cerambycid beetle widely distributed in the Union of South Africa, where it has frequently been found in recently felled or dying trees. It sometimes attacks seemingly healthy trees but is incapable of seriously affecting those which are really thrifty. The species is said to be a native of and one of the most common beetles occurring in Australia, but it is not there considered a pest.

The strawberry weevil (*Anthonomus signatus*), T. J. HEADLEE (*New Jersey Stat. Bul.* 324 (1918), pp. 5-19, figs. 11).—This is a summary of information on the strawberry weevil, based upon investigations conducted during the years 1915, 1916, and 1917. Reports relating to the years 1915 and 1916 have been previously noted (*E. S. R.*, 37, p. 466).

The work during 1917 consisted in the testing of the efficiency of several types of machinery for the application of lead arsenate and sulphur mixture. In tests made on 20 acres of strawberries at Haddonfield a small Niagara power duster, a Dust Sprayer traction duster built for potato work, a Rizzotti horse muzzle sifter, and a Corona two-wheeled puffer were used. In two treat-

¹ *Atti Soc. Ital. Sci. Nat. Milano*, 2 (1860), pp. 165-168.

ments given on May 7 and May 14, about 50 lbs. of material per acre was used in each treatment by the power machine, about 40 lbs. at each dusting by the traction machine, and about 50 lbs. per acre by the sifter in the first application and 67 in the second.

The two-wheeled puffer is said to have proved unadapted to the work, the rough nature of the surface quickly racking it; the labor of working the piston was large and the amount of material delivered seemed inadequate. The material applied with each of the other machines reduced the injury markedly but the traction applications were the least effective of the three. Both the sifter and the power machine reduced the damage to a point where the yield would not suffer. "The sifter does not give an even coat but effects a complete cover. It costs little to make, uses a little more material, gives about as good protection as any, and is adapted to small fields and patches. The traction duster distributes unevenly and does not readily give a complete coating. Its first cost is not so great as that of the power machine, but the protection obtained with it is not so good as that obtained either with the sifter or the power duster. The power duster gives an even coating, is economical in the use of material, and covers the ground very rapidly (25 acres daily). Its first cost is comparatively large."

Reports of the Pennsylvania State Beekeepers' Association (*Rpts. Penn. State Bee-Keepers' Assoc.*, 9-13 (1913-1917), pp. 128).—Among the papers here presented are the following: The Alexander Treatment for European Foul Brood (pp. 97, 98), by E. G. Carr; and Extension Work in Beekeeping (pp. 99-102) and The Results of Apiary Inspection (pp. 111-115), both by E. F. Phillips.

Beekeeping in war times, E. F. PHILLIPS (*Mo. Bul. Cal. Com. Hort.*, 7 (1918), No. 4, pp. 177-181, fig. 1).

Bee disease (*Nature* [London], 101 (1918), No. 2525, pp. 47, 48).—A brief discussion supporting the view that *Nosema apis* is the cause of Isle of Wight disease.

The Texas foul brood law, F. B. PADDOCK (*Texas Sta. Control Circ.* "B" (1918), pp. 3-18).—The text of the law of Texas relating to foul brood and the regulations adopted by the State entomologist are here brought together. A list of the county apiary inspectors is included.

A preliminary list of the ants of Wisconsin, A. C. BURRILL and M. R. SMITH (*Ohio Jour. Sci.*, 18 (1918), No. 6, pp. 229-232).

Notes on and descriptions of the Nearctic wood wasps of the genus *Xiphydria*, S. A. ROHWER (*Ent. News*, 29 (1918), No. 3, pp. 105-111).—A table is given for the separation of the Nearctic species of *Xiphydria*, of which seven are recognized, one being described as new. The larvae of *Xiphydria* are wood borers and confine their attacks to dead or dying branches of deciduous trees.

Report on the importation of scoliid wasps from Madagascar, D. D'EMMERÉZ DE CHARMOY (*Mauritius: Dept. Agr.*, 1917, pp. 5).—This is a report on the introduction into Mauritius of scoliids (*Scolia* spp. and *Elis* spp.), to parasitize *Oryctes tarandus*.

Notes on some British Guiana Hymenoptera (exclusive of the Formicidae), G. E. BODKIN (*Trans. Ent. Soc. London*, pt. 2-4 (1917), pp. 297-321, pls. 3).—This paper includes notes on parasitic Hymenoptera.

New and old West Indian and North American chalcid flies, A. A. GIRAULT (*Ent. News*, 29 (1918), No. 4, pp. 125-131).—This paper includes descriptions of six new species. The genus *Grotiusomyia* is erected and notes are given on *G. nigricans* reared from the larva of *Eudamus proteus* on St. Vincent, British West Indies; *G. flavicornis* reared from a pyramid leaf miner on oak at Washington, D. C.; *Polycystus clypeatus* n. sp., reared from a leaf miner on corn on St. Vincent; *Pseudomphale eudami* n. sp., reared from the larva of *E. pro-* 100350°—19—6

teus on St. Vincent; *Glosterocerus utahensis* from *Symdobius chrysolepis* on *Quercus chrysolepis* at Alpine, Cal.; *Omphalochrysocharis petiolatus* n. sp., from an oscinid on daisy; and *Arthrolytus aeneoviridis* from *Bucculatrix thurberiella* on cotton at Phoenix, Ariz.

The parasites of leaf hoppers, with special reference to the biology of the Anteoninae, F. A. FEXTON (*Ohio Jour. Sci.*, 18 (1918), No. 6, pp. 177-212, figs. 5).—This report of studies of the Anteoninae includes a host list and a diagram showing their interrelations with other parasites.

Parasites control cotton aphid, A. W. MORRILL (*Cal. Cult.*, 50 (1918), No. 25, p. 752).—Serious infestation of cotton near Chandler, Ariz., by the cotton aphid is said to have been controlled by parasites and predators. Fifty-seven per cent of the specimens collected April 22 were found to be parasitized.

Control of red spider, E. R. DE OME (*Mo. Bul. Cal. Com. Hort.*, 7 (1918), No. 3, pp. 112-120, figs. 3).—A popular account.

On the life cycle of the "akamushi," carrier of Nippon river fever, M. MIYAJIMA and T. OKUMURA (*Kitasato Arch. Expt. Med.* [Tokyo], 1 (1917), No. 1, pp. 1-15, pls. 4, figs. 2).—This is a report of studies of a trombidid (*Microtrombidium akamushi*) that bears a close resemblance in many respects to *Leptus autumnalis*, which is considered by most authors to be the larval form of *Trombidium holosericeum*, made simultaneously with but independently of those by Nagayo and others, previously noted (*E. S. R.*, 37, pp. 858, 859).

The authors succeeded in 1916 in rearing the adult from larvæ and conclude that the species should be known as *L. akamushi*. They find that in nature both the nymphs and adults live on the juice of plants, namely, the reed (*Imperata arundinacea*), daisy (*Artemisia vulgaris*), etc. In experimental work 28 larvæ hatched in the laboratory were placed upon a Japanese monkey, which is very susceptible to the disease, and symptoms of a severe type of tsutsugamushi disease were manifested.

FOODS—HUMAN NUTRITION.

The chemical analysis of wheat-flour substitutes and of the breads made therefrom, J. A. LE CLERC and HANNAH L. WESSLING (*U. S. Dept. Agr. Bul.* 701 (1918) pp. 12, pls. 7).—This bulletin gives the results of analyses of more than 30 part substitutes for wheat flour and the bread made from them. The substitutes used were (1) those of low protein or high carbohydrate content, including starches from fruits such as the banana, roots such as the cassava, tubers such as the potato and the dasheen, and nuts rich in carbohydrates such as the chestnut; (2) those from grains and cereals, including buckwheat, grain sorghums, millet, and other more common cereals; (3) those from legumes, including the peanut; and (4) those from certain by-products like bran, wheat germ, cotton seed, peanut oil cake, and soy-bean oil cake.

All the breads analyzed in this investigation were made of mixtures of flour in the proportion of 25 per cent substitute to 75 per cent standard wheat flour. Tables are given of the chemical analyses of the standard flour and substitutes, and of the breads made from them.

All breads containing wheat-flour substitutes (except when starch and rice flour were used) were richer in mineral matter than was wheat-flour bread. The differences in fat content were significant only when materials such as soy-bean or peanut meal were used. The calculated caloric value of the various breads was nearly the same. A wide variation was shown in the protein content, which varied from less than 7 per cent where starch was used to nearly 15 per cent in the case of the soy-bean bread. The color of the mixed bread in most cases resembled more or less the color of the substitute used.

Flour from wheat of different test weights, T. SANDERSON (*North Dakota Sta. Spec. Bul.*, 5 (1918), No. 3, pp. 37-73, figs. 3).—This is a discussion of the data reported by Ladd, et al., and previously noted (E. S. R., 38, p. 663).

The author concludes that a milling and baking test is the best method known for determining the value of any lot of wheat. "The test weight per bushel is the best guide to quantity of flour that any lot of wheat may be expected to produce, and on the average of a number of samples usually indicates the quantity of flour that may be expected within certain limits. All other physical characteristics used in determining grade may or may not indicate the results that can reasonably be expected in the finished products."

"An equitable grading system for wheat can not be devised without considering the value of all of the products obtained from the manufacture of flour, as well as the flour itself."

An introduction by E. F. Ladd discusses the subject of equitable wheat grading.

Use corn meal and corn flour to save wheat (*U. S. Dept. Agr., Off. Sec. Circ. 117* (1918), pp. 4).—Tested recipes for the use of corn meal and corn flour are given.

Use oats to save wheat (*U. S. Dept. Agr., Off. Sec. Circ. 118* (1918), pp. 4).—Tested recipes illustrating the use of ground rolled oats and oat flour in place of wheat flour in bread and cake making are given.

Use rice flour to save wheat (*U. S. Dept. Agr., Off. Sec. Circ. 119* (1918), pp. 4, fig. 1).—Tested recipes for the use of rice flour are given.

Standards for milled rice (*U. S. Dept. Agr., Bur. Markets Doc. 15* (1918), pp. 10).—These standards were prepared by this Department and adopted by the U. S. Food Administration.

Instructions for the sampling, handling, analyzing, and grading of samples of milled rice, F. B. WISE (*U. S. Dept. Agr., Bur. Markets Doc. 16* (1918), pp. 6).—Instructions are given as well as a list of apparatus necessary

Digestibility of protein supplied by soy-bean and peanut (press-cake) flours, A. D. HOLMES (*U. S. Dept. Agr. Bul. 717* (1918), pp. 28).—An extensive summary of the literature is given, in which soy beans and peanuts are shown to be relatively rich in lysin and tryptophane and to contain more efficient protein than those supplied by the common cereals or many of the common legumes. This article reports experiments made to determine the digestibility of the proteins of soy bean and peanut when eaten by normal individuals as a constituent of a mixed diet. The soy bean and peanut meal were served in the form of biscuit and comprised as large a portion as possible of the total protein of the diet. None of the subjects reported any digestive or other physiological disturbances in connection with these diets.

Eighty-five per cent of the soy-bean protein was digested and 86 per cent of the protein of the peanut meal, which indicates a very satisfactory utilization of these proteins by the human body.

"The data obtained in this and other investigations give sufficient evidence to justify the belief that soy-bean and peanut flours, rich in proteins that are well digested and of high biological value, should prove specially valuable additions to the human dietary." The use of these by-products of the oil mills for food purposes rather than for stock feeding and fertilizers is advocated.

Some analyses of vegetables showing the effect of the method of cooking, ANGELIA M. COURTNEY, HELEN L. FALES, and F. H. BARTLETT (*Amer. Jour. Diseases Children*, 14 (1917), No. 1, pp. 34-39).—For the purpose of determining the loss in mineral constituents of vegetables as ordinarily prepared and eaten, a

series of analyses was made of cooked vegetables, considering separately the solid portion usually given as food and the water used in cooking. The results, which are recorded in tabular form, are summarized as follows:

"A large proportion of the mineral content of most vegetables is lost in the water used in cooking by boiling. This loss is only slightly reduced by making the time of boiling a minimum. A very great saving in mineral content may be effected by using the method of steaming. Spinach is the best vegetable to provide a salt addition to the diet."

The banana as a food for children, M. C. PEASE and A. R. ROSE (*Amer. Jour. Diseases Children*, 14 (1917), No. 5, pp. 379-390).—The nutritive value of the banana has been studied by means of a large number of carefully controlled feeding experiments conducted on normal adults, invalids, and children. The fruit was used in various degrees of ripeness and was substituted for the more starchy foods, such as cereals and potatoes. It ranged in amount from one small banana to three-fourths of a day's carbohydrate allowance.

The experimental data reported show a carbohydrate utilization of from 97 to 99 per cent. The digestibility of the raw banana was found to be directly proportional to the ripeness of the fruit, and no deleterious effect was caused by consuming large amounts of fully ripe bananas. Prolonged use of the under-ripe fruit, however, developed undesirable symptoms. It is the opinion of the authors that the banana should not be eaten raw until after the brown spots begin to appear on the skin, at which state it is fully ripe.

Sugar-saving substitutes in ice cream, J. H. FRANDSEN, J. W. ROVNER, and J. LUTHLY (*Nebraska Sta. Bul.* 168 (1918), pp. 8).—This is a report of an investigation of various possible substitutes for sugar in ice cream making.

None of the substitutes tested were found to satisfactorily replace all the cane sugar in the ice cream mix, but four formulas were worked out which save from 30 to 50 per cent of cane sugar, lower the cost of sweetening, and are said to produce ice cream of satisfactory flavor and texture. The amounts and kinds of sweetening agents used are as follows: (1) Seventy per cent cane sugar and 30 per cent corn sirup. (2) Equal weights of cane sugar and corn sugar. (3) Cane sugar and glucose invert sirup in the proportions of 1.25 to 4.5 lbs., respectively. The sirup was made by hydrolyzing a mixture of the following proportions: One lb. of corn sirup, 2 lbs. of sugar, 0.75 lb. of water, and 1 gm. of tartaric acid. Approximately 43 per cent of sugar is saved by the use of this sirup. (4) A mixture of invert sugar, cane sugar, and corn sirup in the proportions of 1.25 lbs. each of corn sirup and invert sugar to 2.25 lbs. of sugar.

Food Surveys (*U. S. Dept. Agr., Food Surveys*, 2 (1918), Nos. 5, pp. 28, figs. 33; 6, pp. 20, figs. 22; 7, pp. 16, figs. 18; 8, pp. 28, figs. 33; 9, pp. 8; 10, pp. 12, figs. 15).—The first of these six numbers presents data as to the commercial stocks of corn, oats, barley, rye, and the food products made from these cereals, not including retail stocks, on hand in the United States, July 1, 1918. The second reports similar data as to fats and oils; the third as to sugar and related products, including food starches; the fourth as to canned goods; and the sixth as to cured meats and fish. The fifth number (No. 9) reports as to commercial stocks of grain, flour, and miscellaneous food products in the United States on September 1, 1918.

Food administration in New York State (*Albany, N. Y.: State Food Com.* 1917, pp. 53).—This contains the text of the Federal Food Control and Food Production Acts of August 10, 1917 (E. S. R., 37, pp. 301, 399); the New York State food commission law of August 29, 1917; and the agreement for a Federal food board for New York State of November 27, 1917.

Nutritive factors in animal tissues, II, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 17-27, figs. 5).—In continuation of the investigations previously noted (E. S. R., 39, p. 665), other animal substances were examined with particular reference to the adequacy of the protein and the presence of vitamin. The following results are reported:

Dried pig's heart was found to contain adequate protein, water-soluble vitamin, and in some cases fat-soluble vitamin. Kidney tissue sufficed as the sole source of protein and both fat- and water-soluble vitamins. Brain tissue served as the sole source of protein and water-soluble vitamin. The oil extracted from pig's liver was found to resemble cod liver oil in containing fat-soluble vitamin. When pig's liver was used as the sole source of water-soluble vitamin in an otherwise adequate diet it was found that if the diet contained 10 per cent of the liver tissue growth always ensued, which was not the case when the proportion was reduced to 5 per cent.

The experiments also demonstrate that the vitamins are not destroyed by heat as all the preparations were heated to about 90° C. for several hours in the process of drying.

Efficiency of maize protein in adult human nutrition, H. C. SHERMAN and JET C. WINTERS (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 301-311; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1997).—Metabolism experiments are reported in which corn meal replaced all other starchy food and furnished from 73 to 97 per cent of the total nitrogen intake. The efficiency of the maize protein proved to be about the same as that of wheat. Nitrogen equilibrium was maintained over long experimental periods with a protein intake considerably below that of the Chittenden standard and of which the largest part was maize protein.

The authors conclude that "this would indicate that in as far as the protein requirement of maintenance is concerned one may rely almost entirely upon maize protein even in the case of a very low protein diet. Certainly one need not hesitate on the score of the protein intake to substitute maize products entirely for the corresponding products of wheat, even where these make up the main part of the food supply."

The metabolism of glycine given intravenously at constant rates, J. H. LEWIS (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 567-576).—This paper reports the first of a series of investigations in which the metabolism of various amino acids will be studied by introducing them into the circulation at known and constant rates for considerable periods of time until equilibrium is obtained and then determining by analysis the total, urea, ammonia, and amino nitrogen in the urine. The results are summarized as follows:

"The tolerance rate for resting dogs of glycine injected continuously into a systemic vein is probably close to 0.2 gm. per kilogram of body weight per hour. Glycine thus injected intravenously at constant rates is readily converted into urea. The excretion of unchanged glycine is materially slower than that of sugars."

Creatinuria in women, MARY S. ROSE (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 1-6).—In an effort to explain the intermittent creatinuria of women eight metabolism experiments were conducted upon six normal women. The diet was in all cases free from preformed creatin and creatinin, and daily estimations of creatin and creatinin elimination were continued for 18 to 32 days. The results are summarized as follows:

"The creatin output of women is very irregular, and no definite relationship between creatin and creatinin has been demonstrated. There is no clearly defined connection between the creatin output and the sexual cycle. Creatin tends to disappear at the onset of menstruation and to reappear shortly afterwards, but it may do the same at other times also. Creatin is excreted on diets

liberal in carbohydrate and causing no acidosis; it is not definitely influenced by the amount of protein in the diet."

Metabolism of fats, J. F. LYMAN (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 7-16).—Two papers are presented.

I. *Utilization of palmitic acid, glyceryl palmitate, and ethyl palmitate by the dog* (pp. 7-11).—"With two dogs the following utilization values were obtained: Lard 96.7 and 96.5 per cent, ethyl palmitate 53.8 and 50.9, glyceryl palmitate 94.8 and 95.4, and palmitic acid 82.5 and 81. Emulsified esters of fatty acids are not absorbed as such, but absorption is limited by the rate of hydrolysis. It is suggested that the melting point of the ester is not the only factor, probably not the chief factor, determining the rate of hydrolysis and absorption."

II. *The effect of feeding free palmitic acid, glyceryl palmitate, and ethyl palmitate on the depot fat in the white rat* (pp. 13-16).—"After feeding free palmitic acid, glyceryl palmitate, or ethyl palmitate to white rats, essentially the same kind of fat is stored in the fat depots, and it consists largely of tripalmitin. Neither free palmitic acid nor ethyl palmitate in appreciable amounts is deposited unchanged in the fat depots. The fat deposited as a result of feeding a fat-poor diet differs markedly from that laid down when the diets contain palmitic acid or its esters."

Studies in carbohydrate metabolism.—I, II (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 209-262).—The present work was planned to determine (1) the total sugar excretion upon various diets and during starvation, and (2) the sugar output in relation to the time of food ingestion and the urinary volume. Two papers are presented.

I. *A preliminary report on the sugar elimination in the urine of the normal dog*, S. R. Benedict and E. Osterberg (pp. 209-216).—In this investigation the urinary sugar output of a dog was determined in frequent periods during 24 hours by the method previously noted (*E. S. R.*, 39, p. 112).

It was found that on a constant diet the total urinary sugar output for the 24-hour period was relatively constant, the amount being totally independent of urinary volume. Food ingestion was found to be the controlling factor in the sugar elimination. Although all mixed 24-hour samples of the urine were strongly acid, individual samples showed that "alkaline tide" invariably follows food ingestion. The alkaline urines were found to contain the larger quantities of sugar. It is pointed out that this may be in accord with the view that there is a definite relationship between hydrogen ion concentration of the blood and sugar utilization by the organism.

II. *A study of the urinary sugar excretion in two normal men*, S. R. Benedict, E. Osterberg, and I. Neuwirth (pp. 217-262).—In this paper a detailed report is presented of the quantitative urinary sugar findings of two normal men in a study of the following specific points: (1) The total sugar output for 24 hours on various diets (normal, high carbohydrate, and low carbohydrate), (2) the relation of the ingestion of food to the excretion of sugar, (3) the tolerance to glucose and to cane sugar on an empty stomach, (4) the effects of an addition of varying amounts of glucose and of cane sugar to a weighed diet, and (5) the relationship between fermentable and nonfermentable sugars.

Tables are given of the fermentable and nonfermentable sugars in the urine in two-hour periods throughout 24 hours on a stated diet. The results are discussed and interpreted by the author.

It was found that urine constantly contains sugar and that this sugar may undergo variations as wide as 100 per cent or more in absolute amounts per hour and in percentage in the urine. In this connection it is pointed out that

the common idea that glycosuria is a sudden phenomenon indicated by the appearance of a positive sugar test by a copper reagent must be wholly discarded, and that an accurate measure of the influence of any substance on sugar excretion can be determined only by a quantitative determination of the sugar content of the urine for a period of at least two hours before and after administration of the substance to be tested. It is suggested that as the term glycosuria implies a sudden point at which sugar appears in the urine it is misleading, and that "glycuresis" would be more satisfactory as indicating an increase of sugar in the urine.

A definite glycuresis was found to follow the ingestion of food even when the food was wholly free from sugar. With one of the subjects the average daily total sugar elimination was 1 gm. on an ordinary mixed diet, 0.75 gm. on a diet low in carbohydrate and high in protein, and 1.5 on a high protein diet. The ingestion of a small amount of glucose in 100 cc. of water before breakfast was frequently followed by a definite diminution in the glycuresis after the meal. In contrast with this, glucose taken with the meal caused marked glycuresis. Cane sugar did not produce this effect. It is suggested that the effect of glucose on an empty stomach may be due to a mild stimulation of the internal pancreatic function and as such may be of therapeutic interest.

The occurrence of and the relationship between the fermentable and nonfermentable carbohydrates are considered to be of special significance. With increase of carbohydrate in the diet both nonfermentable and fermentable substances were found to increase, although the percentage of nonfermentable is lower than on an ordinary or high protein diet. Increase of protein in the diet led to no increase of the nonfermentable substance, showing that the latter is derived from carbohydrate. The authors regard the output of the unfermented sugar as representing a stage in digestion and absorption or a stage in the adjustment of the body to the assimilation of the sugar.

The existence of a gastric lipase, MARY HULL and R. W. KEETON (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 127-140).—Studies on pure gastric juice obtained from dogs with Pavlov stomachs and those with the pylorus ligated are reported, which show that the fasting and acid-free juice always contains an appreciable amount of lipase. This may be recovered from stomachs showing low acid secretion by neutralizing the juice immediately, and from stomachs in high secretory activity by reducing the acid by the action of protein, such as peptone. The lipase is quite sensitive to acid and alkali, being almost completely destroyed by a 15-minute exposure to 0.2 per cent hydrochloric acid. One cc. of fasting juice was found to give a fat-splitting of 28.2 per cent by the Volhard method and 22.05 per cent by the Stadel modification. The concentration of the enzyme in the gastric juice appears to be five or six times that in the succus entericus and the blood serum.

The authors conclude that the lipase is a true gastric secretory product, and that it is highly probable that it does appreciable work in the stomach before the acid can accumulate to the point where it can more than saturate the proteins.

Studies in calcium and magnesium metabolism.—IV, Experiments on man, M. H. GIVENS (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 119-130).—In continuation of work previously noted (*E. S. R.*, 38, p. 569), a metabolism study was made upon nine healthy laboratory workers to determine the normal range for the urinary excretion of calcium and magnesium in adult men and the quantitative relation of these elements to each other. The diets selected were for three-day periods alternately rich in magnesium and in calcium. The urine was collected and determinations of calcium and magnesium made.

The daily urinary calcium and magnesium excretion on a diet of natural foods containing more magnesium than calcium ranged from 0.05 to 0.24 gm. of calcium and from 0.03 to 0.15 gm. of magnesium. On a diet having more calcium than magnesium the limits were from 0.12 to 0.47 gm. of calcium and from 0.05 to 0.23 gm. of magnesium. In general more calcium than magnesium was excreted in the urine. The output of both was increased by consumption of milk, dried milk being practically as effective as raw milk. The calcium excretion was always increased after taking calcium lactate but not to such a great extent as by the use of milk.

Attention is called to the fact that when naturally occurring foods are taken it is practically impossible to increase the intake of dietary calcium without simultaneously increasing the quantity of magnesium ingested. It is also pointed out that there is a decided variation in the amounts of alkali earths excreted through the kidneys by different individuals. The quantities bear no fixed relation to body weight but are probably influenced not only by the diet but also by the tissue reserves, particularly in the bones, of the subject.

Studies in calcium and magnesium metabolism.—V, Further observations on the effect of acid and other dietary factors, M. H. GIVENS (*Jour. Biol. Chem.*, 35 (1918), No. 2, pp. 241-251; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1997).—This is a continuation of the investigations noted above. In an endeavor to explain the discrepancies in the results obtained by the author and by Stehle (E. S. R., 33, pp. 569, 570), new experiments on the effect of acid upon calcium and magnesium excretion were conducted on two dogs.

As a result of these experiments the author confirms his previous statement that "ingested hydrochloric acid is without marked influence on the calcium and magnesium metabolism of the dog." Sodium chlorid, which might arise through the neutralization of ingested hydrochloric acid, was fed in increasing amounts and produced a corresponding increase of calcium in the urine without noticeably affecting the balance of calcium. It was found to have no decided effect upon the excretion of magnesium.

Experiments on the utilization of nitrogen, calcium, and magnesium in diets containing carrots and spinach, H. B. McCLUGAGE and L. B. MENDEL (*Jour. Biol. Chem.*, 35 (1918), No. 3, pp. 353-366; *abs. in Chem. Abs.*, 12 (1918), No. 19, p. 1998).—This paper reports the results of metabolism experiments on dogs to determine the availability for nutritive purposes of the calcium and magnesium of carrots and spinach. Tables are given showing the composition of the daily diets and the average daily balances and percentage utilizations of nitrogen, calcium, and magnesium.

The results obtained tend to show that the calcium in spinach and carrots is not so well utilized as that in milk or in calcium carbonate, and that, therefore, in so far as the calcium is concerned, if milk were not available the addition of a suitable calcium salt would be quite as rational a procedure as a vegetable addition. It is pointed out that this does not speak against the vegetables as sources of vitamins, iron, or other desired dietary factors, but as against the extensive use of vegetables as a dietary substitute for milk in the nutrition of children.

Twenty-four-hour metabolism of two normal infants, with special reference to the total energy requirements of infants, F. B. TALBOT (*Amer. Jour. Diseases Children*, 14 (1917), No. 1 pp. 25-33).—This is a report of the respiratory metabolism for 24 hours of two normal infants, the investigation being undertaken for the purpose of determining the extra energy expended in ordinary activity. The subjects were kept in the respiratory chamber as many hours out of the 24 as possible and short periods were recorded. The average

basal metabolism of one infant was found to be 285 calories, which was increased 143 calories by muscular activity. Corresponding results with the other subject were basal metabolism 338 and increase in metabolism 143 calories.

In estimating roughly the caloric requirement of a normal infant the author suggests the addition to the basal metabolism of 15 per cent if the infant is very quiet, 25 per cent if normally active, and 40 per cent if extremely active. To this should be added 15 per cent for energy lost in the excreta and 20 per cent for growth. On this basis the daily requirements of the two infants were, respectively, 100 and 94 calories per kilogram of body weight. It is considered that infants fed on cow's milk, particularly on modified milk containing large amounts of protein, will require more food than infants fed on human milk because the stimulating action of protein causes extra heat to be excreted during digestion.

ANIMAL PRODUCTION.

The application of genetics to breeding problems, L. J. COLE (*School Sci. and Math.*, 18 (1918), No. 5, pp. 447-454, figs. 6).—A brief review of the advance that has been made in the method of research in genetics is followed by a discussion of certain breeding problems from the standpoint of their possible explanation on the factor basis.

Studies of inheritance in guinea pigs and rats, W. E. CASTLE and S. WRIGHT (*Carnegie Inst. Washington Pub.* 241 (1916), pp. IV+192, pls. 7, figs. 6).—Part 1, by W. E. Castle, gives an account of an expedition to Peru in search of living specimens of *Cavia cutleri*, a wild species of cavy found there, and reports the results of hybridization experiments with *C. cutleri* and guinea pigs, hybridization experiments with a race of feral guinea pigs from Ica, Peru, and of the hybridization of domesticated guinea pigs from Arequipa. The results of these experiments are discussed in their bearing upon size inheritance.

Part 2 reports studies by S. Wright upon the inheritance of color and of other coat characteristics in guinea pigs, with special reference to graded variations. A classification is given of guinea pig fur, skin, and eye colors, together with definitions of fur colors and a hypothesis concerning the formation and distribution of pigment in guinea pigs.

Part 3, by W. E. Castle, is a report of further studies of piebald rats and selection,¹ with observations on gametic coupling.

The case of the blue Andalusian, W. A. LIPPINCOTT (*Amer. Nat.*, 52 (1918), No. 614, pp. 95-115).—In an effort to determine the fundamental differences between the three Andalusian phenotypes, black, blue, and blue-splashed, a microscopic study was made of feathers from numerous individuals of each phenotype in the unrelated flocks of the poultry departments of the Kansas State Agricultural College and the University of Wisconsin. A short account is given of the most obvious differences noted.

It was found that the pigment in all three phenotypes is black, the differences in appearance being due to the distribution and arrangement of the pigment or to its absence. Blue Andalusians are like black Andalusians in that they are self-colored. They are like the blue-splashed in that homologous pigmented feathers in both sexes have the same condition with reference to the restriction of pigment in the feather structure. The 1:2:1 ratio observed in breeding blues is explained as a combination of two 3:1 ratios.

¹ Carnegie Inst. Washington Pub. 195 (1914), pp. 56, pls. 3.

The condition in the blues is explained as being due to the combined action of two factors, *R* and *E*. *R* acts on black pigment, restricting its distribution in such a way that it gives the characteristic blue-gray appearance. *E* extends black pigment to every feather on the fowl's body. Whether *R* and *E* are located on identical loci of homologous chromosomes or are the dominants of two pairs of factors linked to the recessive allelomorph of the other, is not known. If the latter is the condition, crossing-over might occasionally occur between *R* and *E* with small likelihood of detection. If crossing-over does occur, *RE* gametes are possible, which appears in turn to make possible true-breeding blues.

On certain secondary sexual characters in the male ruddy duck, *Erisma-tura jamaicensis*, A. WETMORE (*Proc. U. S. Nat. Mus.*, 52 (1917), pp. 479-482, fig. 1).

Acidity of silage made from various crops, R. E. NEIDIG (*Jour. Agr. Research* [U. S.], 14 (1918), No. 10, pp. 395-409).—The purpose of the investigation described, made at the Idaho Experiment Station, was to ascertain whether the acids found in good corn silage are also developed when other commonly grown crops are used for silage purposes. The results of determinations of the acetic, propionic, butyric, and lactic acids as well as the total acidity produced in the silage of the several crops and crop mixtures under investigation are given in tables. A list of 16 references to literature cited is presented.

A review of previous studies, together with results secured by the author in the present investigation, shows that all samples of high-class corn silage examined contained lactic, acetic, and propionic acids. The nonvolatile lactic acid usually occurred in excess of the sum of the volatile acetic and propionic acids.

The crops and crop mixtures under examination from which first-class silage was secured and which showed an acid fermentation similar to corn silage were as follows: Oats and peas in any proportion, oats, peas, wheat, and peas, clover, and clover and wheat straw. A mixture of alfalfa and wheat straw did not develop an acid fermentation similar to corn and was unfit for feeding purposes. Butyric acid was always found in samples of spoiled or partly spoiled silage. In a sample of silage made from alfalfa alone, taken three months after siloing, no butyric acid was found, lactic acid was also absent, and the silage appeared palatable, but in a sample taken nine months after siloing butyric acid had developed, and the silage was unfit for feeding purposes.

[Work in animal husbandry at the Huntley reclamation project experiment farm in 1917], D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1917*, pp. 7, 8, 12-14, 16, 17, 22-29).—A statement of the number and value of live stock on the project is presented in a table.

The average results of experiments on pasturing alfalfa with pigs for five years, 1913-1917, are summarized. Fall pigs were pastured from April to July, and spring pigs from July to October, at the rate of 2,000 to 2,500 lbs. per acre. The pigs were pastured alternately for from 9 to 12 days on two equal areas, which allowed a more uniform growth of alfalfa and facilitated irrigation. A grain ration of 2 lbs. of shelled corn per 100 lbs. of live weight was fed daily in the evening. The average results for the 5-year period show that 18 fall pigs and 34 spring pigs were pastured 147 days, making a total gain of 2,493 lbs. or 0.69 lb. daily per pig, and requiring 2.84 lbs. of grain per pound of gain.

The spring pigs were used in the fall to hog off corn, being put on plats of mature corn at the rate of 1,000 to 1,500 lbs. per acre. During the 6-year

period, 1912-1917, on the average and calculated to an acre basis 17 pigs were fed 22 days, with a total gain of 703 lbs. The yield of the corn was estimated at 50.4 bu. and the grain fed per pound of gain at 4.4 lbs.

In 1916 and 1917 pigs taken off the alfalfa pasture were turned into mature corn with a stand of rape seeded between the rows at the rate of 4 lbs. per acre about the last of July. A comparison of the average results with those for the 5-year period of hogging down corn without rape showed no increase in gain in favor of rape.

A pasture carrying-capacity test was conducted from May 14 to October 5, 1917, on four quarter-acre plats of mixed grasses fenced in two inclosures and pastured alternately for periods of from 7 to 14 days. All plats were irrigated seven times during the season and one-half of each plat was top-dressed with manure at the rate of 10 loads per acre. Two cows were pastured the entire season and one only a part of the season, the total number of cow days being 325. During this period, including 11 days they were kept off the pasture, the cows produced 5,777 lbs. of milk, containing 259 lbs. of fat, valued at \$107.90. Allowing for the hay fed the 11 days the cows were not on pasture, the value of the butter fat produced from the 1 acre of pasture was \$96.

A sheep-pasturing test was conducted in 1917 on four quarter-acre plats of mixed grasses comprising bromie grass, orchard grass, meadow fescue, Kentucky blue grass, perennial rye grass, tall fescue, and white clover. The results of this test and of a similar trial in 1916 indicated that the carrying capacity per acre of the pasture was about six ewes and their lambs.

Experiments with hogs carried on in cooperation with the Bureau of Animal Industry of the U. S. Department of Agriculture, in 1917, included comparisons of different grain rations for hogs on alfalfa pasture, of corn and barley for pigs and for sows and litters on alfalfa pasture, of single and of divided alfalfa pasture for alternate pasturing, and of corn and barley for finishing hogs in the dry lot.

Of six lots of pigs started on pasture May 16, lot 1 received no grain, lot 2 was fed a 1 per cent ration of corn (1 lb. of corn daily for each 100 lbs. of live weight), lots 3 and 4 a 2 per cent ration of corn, lot 5 a 3 per cent ration of corn, and lot 6 a full ration taken from a self-feeder. All lots except lot 4 were on divided pasture, and all were removed from the pasture on July 11 and placed in a dry lot for finishing except lots 1 and 2, which remained on pasture until September 19. The results of the test are given in the following table:

Results of feeding fall pigs varying grain rations as a supplement to alfalfa pasture.

Lot.	Number of pigs.	Area of pasture.	Pasture period.	Initial weight.	Final weight.	Daily gain.	Gain per acre.	Grain per lb. of gain.
		<i>Acres.</i>	<i>Days.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>
1.....	6	0.50	126	77	93	0.13	190	.....
2.....	6	.25	126	76	119	.34	872	3.12
3.....	6	.25	56	81	124	.77	860	2.67
4.....	6	.25	56	78	124	.82	920	2.50
5.....	6	.25	56	78	134	1.01	1,356	3.12
6.....	6	.25	56	79	174	1.71	2,292	3.66

A similar test was conducted with spring pigs on alfalfa pasture from July 12 to October 3. A lot, designated lot 5, receiving a 2 per cent ration of barley was added, lot 6 receiving the 3 per cent ration of corn, and lot 7 the full

ration from a self-feeder. Otherwise the rationing was the same as for the fall pigs. The results are brought together in the following table:

Results of feeding spring pigs varying grain rations as a supplement to alfalfa pastures.

Lot.	Number of pigs.	Area of pasture.	Initial weight.	Final weight.	Daily gain.	Gain per acre.	Grain per lb. of gain.
		<i>Acres.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>
1.....	7	0.50	35	46	0.14	162	.....
2.....	7	.25	34	49	.18	432	2.33
3.....	8	.25	35	65	.36	965	2.88
4.....	8	.25	34	63	.34	924	2.92
5.....	8	.25	35	63	.33	888	2.95
6.....	9	.25	35	81	.56	1,684	3.09
7.....	8	.25	35	111	.90	2,420	3.09

From May 15 to July 11. corn and barley as supplements to alfalfa pasture were fed to three lots of two sows each and their litters. One lot was given a 2 per cent ration of ground barley and the other lots received a 2 per cent ration of corn. The pasture for each lot divided for alternate pasturing was $\frac{1}{4}$ acre in size. The pigs fed on ground barley made slightly higher gains and consumed less grain per pound of gain than either of the lots receiving a 2 per cent ration of corn. The sows on barley were also maintained in better condition, and the loss in weight was less than in those fed on corn.

The results of several other feeding tests reported indicated that although pigs kept on alfalfa pasture without grain had lost in weight they had not been stunted but were in good thrifty condition. The data secured suggested further that if pigs weigh 75 lbs. or more it may be profitable to put them on a full-grain ration at the time they are placed on alfalfa pasture. It was also shown that when pigs weighing 35 to 40 lbs. are turned on alfalfa pasture it may be economical to feed not more than 2 lbs. of grain daily per 100 lbs. of live weight but that it is not advisable to carry them on alfalfa alone.

Experiments in crop utilization, C. R. LETTEER (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1917, pp. 24-27, fig. 1*).—The experiments reported were in continuation of work previously noted (*E. S. R.*, 38, p. 470). Two acres seeded to winter oats, October 24, 1916, were divided and pastured alternately with two steers from January 24 to February 23 and from April 11 to June 7, 1917. During the two periods the steers made a total gain in weight of 243 lbs. This gain at 9 cts. per pound represented a pasture value of \$10.94 per acre.

Two acres seeded to Sudan grass, March 27, 1917, were divided for alternate pasturing from June 7 to July 10, July 25 to August 28, and from September 24 to October 8 with the two steers removed from the oat pasture. During the three periods the steers made a total gain of 236 lbs. in weight. Valuing this gain at 9 cts. per pound the Sudan grass pasture was worth \$10.62 per acre.

Maine cooperative campaign of live stock production and feeding (*Augusta, Me.: Dept. Agr. [1917], pp. 10*).—This pamphlet was published in December, 1917, by the Public Safety Committee on Live Stock Production and Feeding in cooperation with the Maine Department of Agriculture and the U. S. Food Administration. It gives a statement of the effects of the war upon the live-stock industry, and suggests how Maine can assist by increasing the production of pure-bred stock and by economy through use of substitute feeds.

Why not raise your own furs? N. DEARBORN (*Amer. Mus. Jour. 17 (1917), No. 8, pp. 551-555, figs. 3*).—This article reviews the history of fur farming in the United States and Canada, and points out briefly the possibilities of raising

mink, skunk, silver fox, marten, fisher, otter, blue fox, raccoon, and beaver for the production of furs.

The possibilities of a farm flock in war time, V. G. AUBRY (*New Jersey Stas. Hints to Poultrymen*, 6 (1918), No. 12, pp. 4).—A popular discussion of farm poultry houses, grade and quality of stock, and feeding and care of farm flocks. Financial statements based on a flock of 200 birds, and including cost of installation, operating expenses, and returns are presented.

Efficiency of commercial egg candling, M. K. JENKINS and C. A. BENGSTON (*U. S. Dept. Agr. Bul. 702* (1918), pp. 21, figs. 2).—The work here described and carried on in commercial packing houses in the Middle West and in distributing houses in the East was undertaken to determine the relative error in the candling of different types of good and bad eggs, the relation of the quality of eggs to accuracy in candling, the relative occurrence of bad eggs not to be found by candling, and the comparative degree of accuracy of skilled and unskilled candling crews. The data obtained in these studies are presented in detail in tabular form and discussed.

It was found that the bad eggs graded as fit for food fell into two groups, those distinguishable and those not distinguishable by candling. The proportion of the first group in edible grades is regarded as a factor in indicating the efficiency of candling. The accuracy of the work was shown to depend upon the quality of the eggs and the skill of the candlers.

Experienced workers missed only a negligible number of bad eggs in high-grade lots, but when a large percentage of the good eggs in the lot had weak whites and yolks and the percentage of bad eggs ran high, the difficulties in detection increased, and the number of bad eggs miscandled was greater. In these studies, with skilled workers, the average number of bad eggs miscandled in a case of 30 doz. varied from 0.2 in spring firsts to 10.77 in very low-grade refrigerator or cold storage eggs. The number of bad eggs not distinguishable by candling ranged from 0 to 6.93 per case.

The presence of black rots, eggs with mold spots, and eggs with heavily adherent yolks in edible grades is regarded as evidence of carelessness in candling. The types of eggs found chiefly in a miscandled group were those designated as white rots, mixed rots, and blood rings, and those with yolks slightly stuck to the shell or with bloody whites. It is pointed out that a brown shell or a light-colored yolk makes differentiation more difficult and that eggs with green whites or with normal appearance but with bad odors are not recognized by candling.

Good eggs frequently miscandled were those with brown shells, hatch-spot eggs, weak eggs, eggs with the yolk floating near the shell, eggs with olive-colored yolks, and eggs with movable air cells. The average number of good eggs found in the rejects by recandling was a dozen to a case or less with experienced candlers, and from three to six dozen with inexperienced candlers under good management, who were directed to put all doubtful eggs with the rejects. Under poor management poor candlers sometimes miscandled 11 dozen good eggs per case. The enforcement of the system of checking the work of individual candlers is regarded as the best means of maintaining a high efficiency in a candling force.

DAIRY FARMING—DAIRYING.

Cattle, breeds and origin, D. ROBERTS (*Waukesha, Wis.: Author*, 1916, pp. 177, figs. 103).—This is a comprehensive text for rural and city schools, written in popular style and dealing with the history of the cow and the breeds of dairy and beef cattle in America, including notes on the selection, breeding,

registration, and marketing of cattle, the modern dairy barn, and the feeding of dairy cows.

Rearing dairy calves, L. S. GILLETTE, A. C. McCANDLISH, and C. H. STANGE (*Iowa Sta. Circ. 50 (1918), pp. 16, figs. 5*).—This circular discusses the type of calves to rear, the effect of the sire and his management, the care of the dam, and the management of the calf and heifer. Notes are given with reference to feeds, including milk supplements and substitutes and to dehorning and marking calves, and brief directions for the treatment of calf diseases and for the prevention of discomfort from lice and flies.

Experimental results secured at the station show that with the continued use of pure-bred Guernsey, Holstein, and Jersey sires, the first generation produced an increase of 45 per cent and the second generation of 110 per cent of milk over their scrub dams and grand dams. The increase in butter fat was 39 and 102 per cent, respectively.

Effect of period of heat on milk and fat production, J. J. HOOPER and P. E. BACON (*Hoard's Dairyman, 55 (1918), No. 21, p. 879*).—Data collected at the Kentucky Experiment Station during the past five years indicate that no very decided fluctuation occurs in the milk and fat production of cows during the period of heat. The records of 29 cows show that fat production declined, on an average, 0.1 lb., and milk production 1.5 lbs., on the day of most evident heat. Several of the cows were not affected by oestrus, and one or two cows increased slightly in milk and fat production.

A few sensitive or nervous cows, however, are greatly affected by the oestral period. The milk of one cow tested 3.7 per cent fat the morning of the onset of heat, while that afternoon her milk tested 1.9 per cent and the next day 7.3 per cent of fat. Her fat production on the day of most evident heat was 0.228 lb., while on the other days it averaged 1.25 lbs.

Preliminary note on certain changes in some of the nitrogenous constituents of milk caused by bacteria, G. C. SUPPLEE (*Jour. Dairy Sci., 1 (1917), No. 4, pp. 313-319*).—A study is reported of changes in the nitrogenous constituents of milk caused by bacteria before any change is evident in the physical appearance of the milk. In the analyses, which were made after 24 hours' incubation of the inoculated milk, fractional precipitation was obtained by various reagents and the nitrogen in each of the fractions subsequently determined.

Of the 12 species of bacteria tested all but *Pseudomonas liquefaciens* and *Bacillus lactis viscosus* caused a decrease in the casein fraction, the decrease being most marked with organisms of extreme proteolytic properties. With 7 of the organisms there was an increase in the albumin fraction. In the case of 4 of the 5 organisms which caused a decrease in the albumin fraction there was little or no decrease in the casein fraction. The changes in the nitrogen content of the phosphotungstic-acid fraction, ammonia nitrogen, and soluble nitrogen other than ammonia are discussed in their bearing upon the undesirable effects of bacterial action on milk. The milks used for these analyses showed a much higher bacterial content than ordinary market milk.

Experiments on determination of cow manure in milk; moisture content and solubility of cow manure, G. B. TAYLOR (*Jour. Dairy Sci., 1 (1917), No. 4, pp. 303-312, figs. 2*).—This series of experiments was conducted at the Dairy Division laboratories of the U. S. Department of Agriculture to determine primarily whether cow manure in unstrained milk can be measured quantitatively by chemical methods.

By a method which is briefly described it was possible to obtain good results when the original quantity of manure present was fairly large. For average

market milk, however, the method is impractical. It was also found, by means of a modified method, that a series of disks containing known amounts of manure could be made which will give fairly accurate results when compared with the sediment from milk after using the sediment tester. Since accurate determinations can be made only with unstrained milk and all market milk is strained, there seems to be no simple practical method.

In solubility tests with 26 composite samples of fresh manure from cows fed bran, corn meal, cottonseed meal, and corn silage, an average of 1.78 per cent of the solids calculated on a wet basis was soluble in water, which, added to the 82.76 per cent of moisture present, gave an average water solubility of fresh manure of 84.54 per cent. For the 5 samples of air-dried manure 10.12 per cent of the solid matter went into solution, which, added to the 5.74 per cent of moisture present, gave an average water solubility of 15.86 per cent. In the same way it was found that 83.72 per cent of fresh manure and 10.96 per cent of air-dried manure was soluble in milk. Experiments with bottled milk indicated that about 90 per cent of the foreign solid matter settles to the bottom of the bottle where it may be seen.

The standardization of market milk, L. L. VAN SLYKE (*Jour. Dairy Sci.*, 1 (1917), No. 4, pp. 361-370).—The author discusses the subject from the following standpoints: (1) Effect of standardizing or adjusting milk upon the composition of normal milk; (2) relations of standardized or adjusted milk to producers, distributors, and consumers; (3) advantages and objections; and (4) legal regulations relating to the production and sale of standardized or adjusted milk. Standardized or adjusted milk is defined as "milk in which the original fat content has been changed, and also the ratio of fat to the other milk solids, by the removal of milk fat, or by the addition of skim milk, or by the addition of cream."

The necessity of a pure raw milk, H. D. CHAPIN (*Jour. Amer. Med. Assoc.*, 69 (1917), No. 11, pp. 886, 887).—This is a general discussion of the properties of raw milk and the alteration of some of these properties brought about by heating the milk.

The author concludes that "certified milk, produced with scrupulous care under the oversight of a reliable medical commission and then properly handled in the home, is the ideal solution of the milk problem, at least as far as the delicate infant or invalid is concerned."

Clotted cream, W. SADLER (*Jour. Dairy Sci.*, 1 (1917), No. 4, pp. 291-302, figs. 6).—This article briefly reviews the history of clotted cream in England, outlines the methods in vogue in making clotted cream at present in the west of England, and reports results of experiments in making the product at the Midland Agricultural and Dairy College at Kingston, Derby.

In these experiments "scalding" for 20 to 30 minutes with a final temperature of 187° F., after the milk had stood for 12 to 15 hours, proved satisfactory. One lb. of clotted cream was produced from 23 lbs. of milk. Analyses are given of the original milk, the clotted cream, and the resulting scald milk. The fat content of the clotted cream averaged about 62 to 64 per cent, and of the scald milk about 0.75 per cent.

The results indicate "that provided a suitable system be adopted and reasonable care be taken in management and manipulation, clotted cream having the typical and characteristic properties can be produced in any district. While a rich milk is preferable, it is not at all essential for the production of characteristic clotted cream to have only the breeds of cattle favored by the producers in Devonshire and Cornwall. The flavor and keeping properties of the cream are problems of a bacteriological nature."

The use of pepsin as a rennet substitute in Cheddar cheese making, P. S. LUCAS (*Oregon Sta. Bul. 155 (1918), pp. 15, fig. 1*).—Experiments on the relative values of pepsin and rennet as coagulants in cheese making are reported, and a brief history of the use of pepsin for this purpose is presented. Directions for the use of pepsin in the cheese factory are given, and the causes of difficulties in its application are pointed out.

The results of a study of the effect of pepsin and rennet on the time required for coagulation, the time of making, and the condition of the curd are given in tables. It was found that it required a slightly longer time to coagulate milk of 0.2 per cent acidity with 4 oz. of a 5 per cent pepsin solution per 1,000 lbs. of milk than it did when rennet was used at the same rate. The average time from setting to coagulation in 12 tests was 8 minutes for the rennet and 9.75 minutes for the pepsin.

The loss of fat in the whey with careful handling during the making process was about 10 per cent greater with pepsin than with rennet, the average losses from 25 vats of milk being 0.24 per cent and 0.218 per cent, respectively. A study of the moisture content of the cheese indicated that a pepsin-curd cheese is ordinarily slightly more moist than a rennet-curd cheese, the average moisture content in 12 tests being, respectively, 38.08 and 37.18 per cent. The yields per 100 lbs. of milk were only slightly in favor of the rennet-curd cheese.

Scale pepsin held in the laboratory at ordinary room temperatures for at least four years gave as good results as were secured with fresh substance. The use of pepsin had no effect on the flavor and the body of the cheese but it reduced somewhat the quality of the texture. It is stated that spongy pepsin, on account of its greater solubility, is more desirable than the powdered, granular, or scale form. It is shown that at prevailing prices the cost of coagulating 1,000 lbs. of milk is 23.4 cts. with rennet extract, 91.2 cts. with powdered rennet, 7.4 cts. with spongy pepsin, 13 cts. with liquid pepsin, and 17.2 cts. with rennet pepsin.

Fourth annual report of the creamery license division for the year ending March 31, 1918, R. E. CALDWELL and T. H. BROUGHTON (*Indiana Sta. Circ. 81 (1918), pp. 44, figs. 3*).—A report of the activities of the creamery license division of the station during the year, including lists of licensed testers and licensed plants manufacturing dairy products in the State. Statistics on the output of dairy products in Indiana by factories purchasing milk or cream on the butter-fat basis are submitted.

VETERINARY MEDICINE.

The prevention and eradication of destructive animal diseases and the effect upon agriculture and the meat supply, A. R. WARD (*Proc. 2. Pan Amer. Sci. Cong., 1915-16, vol. 3, pp. 702-709*).

The dispensatory of the United States of America, J. P. REMINGTON, H. C. WOOD, JR., S. P. SADTLER, C. H. LAWALL, H. KRAEMER, and J. F. ANDERSON (*Philadelphia and London: J. B. Lippincott Co., 1918, 20. ed., rev., pp. CXXII+2010*).—Extraordinary advances in the pharmaceutical and medical sciences since the appearance of the nineteenth edition of this work in 1907 have made necessary so extensive a revision of the work that it has been almost entirely rewritten, and the staff of editors increased to six. In this edition the dose of each drug is given at the end of the description of its therapeutic uses, and a summary of the incompatibilities of each of the more important drugs has been placed immediately before the description of its therapeutic uses. Articles on the so-called vaccines have been added and those on the various serums enlarged.

The introductory part includes a glossary, index to diseases, and the text of the Food and Drugs Act (pp. LI-LXVI), an abstract of food inspection decisions (pp. LXVI-XCVI), and the Harrison Narcotic Act (pp. XCVII-CVI), together with an index thereto (pp. CVII-CXXII). Part 1 (pp. 1-1221) contains a discussion of all the remedies recognized by the U. S. and British pharmacopœias, alphabetically arranged; part 2 (pp. 1223-1673), the National Formulary and nonofficial drugs and medicines; and part 3 (pp. 1675-1841) consists of the tests and test solutions of the two pharmacopœias, weights and measures, the art of prescribing medicines, an abstract of the fourth edition of the National Formulary (E. S. R., 36, p. 378), and cognate miscellaneous matters. The remaining pages (pp. 1843-2010) are taken up by an index.

Physiological properties and medico-surgical applications of guaiacol and benzoic acid, L. MENCIARE (*Compt. Rend. Acad. Sci. [Paris]*, 165 (1917), No. 25, pp. 1023-1026).—Experiments in vitro and in vivo are described, illustrating the biological properties of a solution of guaiacol and benzoic acid and its mode of action as an antiseptic. Unlike the action of hypochlorites it appears to preserve instead of dissolve the diseased tissues and to activate in them defensive reactions. Injected into the blood stream it is nonhemolyzing and bactericidal and does not seem to alter osmotic equilibrium.

The author concludes that the nontoxicity of guaiacol associated with benzoic acid and its protective action on protoplasm and body liquids make it an antiseptic worthy of general application.

General anesthesia by chloralose in cases of traumatic shock and hemorrhage, C. RICHER (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 25, pp. 1026-1033).—The author states that, unlike all other anesthetics, chloralose tends to counteract the symptoms of traumatic shock and hemorrhage, and hence is useful in certain severe cases. In other cases, while chloralose-chloral can be safely used, ether or chloroform is considered preferable.

The sterilization of wounds by physiological agency, A. E. WRIGHT, A. FLEMING, and L. COLEBROOK (*Lancet [London]*, 1918, I, No. 24, pp. 831-838, figs. 13).—Experimental data on the effect of the different blood fluids on microorganisms likely to be found in wounds are given, from which the following generalizations are drawn:

Serum from normal blood and normal lymph constitutes for the majority of microbes met with in foul wounds a very unfavorable culture medium. Only the streptococcus, the staphylococcus, and certain diphtheroid bacilli can grow in unaltered serum. Trypsinized serum, or serum found in the wound cavity and tissues when any exudate stands stagnant on disintegrated leucocytes, provides an excellent culture medium for practically every species of microbe. Neutralized or partially neutralized serum, such as is present in conditions of collapse, is a medium in which the gas-gangrene bacilli flourish, and hence the gas-gangrene infection in the tissues can be combated by draining away the acidosed lymph. The whole blood gives a medium similar to normal serum.

The application of these principles to the treatment of wounds is discussed in detail.

A preventive and curative serum for gas gangrene, H. VINCENT and G. STODEL (*Compt. Rend. Acad. Sci. [Paris]*, 167 (1918), No. 3, pp. 137-140).—The serum described by the authors is prepared by injecting into horses a multiple culture of organisms of the principal anaerobic type, which determines the gaseous gangrene syndrome. The serum is said to have been used with good results, both as a preventive measure in patients with severe wounds not yet gangrenous and as a curative measure in more or less advanced cases of gas gangrene.

Stagger grass (*Chrosperma muscætoxicum*) as a poisonous plant, C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr. Bul. 710 (1918), pp. 14, figs. 8*).—Reports received from Wilmington, N. C., in March, 1911, of the poisoning of cattle by "stagger grass" led to the investigations here reported. Experimental feeding work with this plant, which has been known locally in parts of North Carolina as dangerous to cattle and sheep, has confirmed the opinion of its poisonous properties and has shown that it is an extremely toxic plant. "As the plant occurs from Long Island to Florida and as far west as Arkansas, it seems probable that it may cause losses of stock in many places besides those reported."

Comparative toxicity of cottonseed products, W. A. WITHERS and F. E. CARRUTH (*Jour. Agr. Research [U. S.], 14 (1918), No. 10, pp. 425-452, figs. 5*).—This is a report of studies carried on at the North Carolina Experiment Station, in continuation of those previously noted (*E. S. R., 33, p. 685*), in which various cottonseed products, including raw cottonseed kernels, ether-extracted kernels, gossypol, and several meals have been fed to rats, rabbits, poultry, and swine.

"Raw cottonseed kernels and the gossypol therefrom have been found highly toxic to all these animals. Cooking the kernels under oil-mill conditions causes a profound reduction in toxicity. This change is so great that the thoroughly cooked products show no pronounced toxic effect on rats and poultry in suitable diets. Thoroughly cooked meals, however, appear to be definitely injurious to rabbits and swine, which are peculiarly susceptible to cottonseed meal 'injury.' Rats and fowls are able to withstand much larger relative amounts of cottonseed meal for longer periods. In the 'cold-pressing' process of making cottonseed meal the toxic substance passes into the oil to a great extent, thus leaving a meal which may be less harmful than certain hot-pressed meals."

A bibliography of 16 titles is appended.

On the toxicity of the venom of the Mexican (Durango) scorpion [*Centruus exilicauda seu gracilis*] as compared with that of the Chinese scorpion [*Buthus martensi*], S. KUBOTA (*Jour. Pharmacol. and Expt. Ther., 11 (1918), No. 6, pp. 447-489, figs. 19*).—"The amount of extractive substance contained in the poisonous glands of different species of scorpion and of the alcohol insoluble toxic matter of the extract appears to differ in different species, Mexican sting containing more extractive substance and alcohol insoluble toxic matter than the Chinese. The active principle of the extract from scorpion glands seems to be of proteid nature."

[Studies on the *Ascaris lumbricoides*], F. H. STEWART (*Trop. Vet. Bul., 6 (1918), No. 2, pp. 97-103*).—This is a review of the author's studies.

Recent progress in the development of methods for the control and treatment of parasites of live stock, B. H. RANSOM (*Proc. 2. Pan Amer. Sci. Cong., 1915-16, vol. 3, pp. 709-719*).

The serum diagnosis of pregnancy in horses and cows by means of the Abderhalden reaction, T. SHIMAMURA and S. MATSUDA (*Jour. Col. Agr. Imp. Univ. Tokyo, 3 (1917), No. 4, pp. 159-169*).—Statistics are reported on the use of the Abderhalden pregnancy test with cows and mares. The test proved reliable in 81 per cent of the 34 cows used and in 75 per cent of the 41 mares. With cows a positive test was given about 10 days after conception and with mares about 34 days.

The Abderhalden reaction, L. GRIMBERT (*Jour. Pharm. et Chim., 7. ser., 17 (1918), No. 10, pp. 333-340*).—This is a review of the opinions of various authors in regard to the nature and specificity of the Abderhalden reaction.

Immunity and tissue transplantation.—III, A comparison of heterotransplantation and homoiotransplantation, M. S. FLEISHER (*Jour. Med. Research,*

38 (1918), No. 3, pp. 353-369).—Continuing investigations previously noted (E. S. R., 39, p. 487), the author has compared the reactions of tissues transplanted into homologous and heterologous animals following the technique described in the earlier papers.

It was found that guinea-pig kidney transplanted into guinea pig showed active regeneration at an earlier period than did the same kidney transplanted into rabbits. Rabbit kidney transplanted into rabbit showed far better regeneration than did the same tissue transplanted into guinea pig. The connective tissue reaction was more marked about homoiotransplants than about heterotransplants and in general was more marked in guinea pigs than in rabbits. The leucocytic reaction was constantly more marked about tissues in rabbits than in guinea pigs. The rabbit seemed to be a relatively better soil for the growth of guinea-pig kidney than the guinea pig for rabbit tissue.

The author points out that in comparing homoiotransplants and heterotransplants there should be taken into consideration the general reactions which constantly differentiate the reactions about homoiotransplants from those about heterotransplants, the individual reactions of the animals serving as hosts, and the special actions or activity of the transplanted tissue. The factors considered of greatest importance in the poorer growth of heterotransplants are the body fluids through the presence of injurious substances or the lack of substances necessary for the growth of the heterotransplant.

Immunity reactions in hydrated and concentrated tissue, F. W. SCHLUTZ (*Amer. Jour. Diseases Children*, 16 (1918), No. 3, pp. 135-142; *abs. in Jour. Amer. Med. Assoc.*, 71 (1918), No. 13, p. 1088).—The author reviews the literature on the subject and describes investigations undertaken to show whether there is any difference in the defensive mechanism of hydrated or concentrated tissue, using determinations of immune reactions as an index.

Lysin, precipitin, and agglutinin reactions were conducted on a series of fat and lean guinea pigs. The lysin reaction was negative in practically all of the fat animals but was positive, sometimes to a marked degree, in over 60 per cent of the lean animals. The precipitin reaction was negative in both series. The agglutinin reaction was present in 11 per cent of the fat animals and in over 70 per cent of the lean.

The author concludes that the results of the lysin and agglutinin reactions would seem to indicate a difference in immunity in favor of the concentrated tissue.

A time-governed slide method for the agglutination test on a series of microbic emulsions, W. BROUGHTON-ALCOCK (*Jour. Roy. Army Med. Corps*, 30 (1918), No. 4, pp. 424-431, figs. 2).—A method for the rapid detection of agglutinins is described which is said to permit of the simultaneous examination of several standard emulsions of microorganisms and of the determination of results in three or four minutes. The specific agglutinins can not only be detected but can be distinguished from any co- or hetero-agglutinin which may also be present in the serum, and possible errors of diagnosis by single emulsion examination can thus be avoided.

Micro- and macro-methods of cultivating anaerobic organisms, J. HOLKER (*Jour. Path. and Bact.*, 23 (1918), No. 1, pp. 28-39, figs. 11).—Various methods which the author has found satisfactory for cultivating anaerobic organisms, with particular reference to conditions suitable for wide ranges in the amount of culture fluid, are described. The different forms of apparatus used are illustrated by diagrams.

Contributions to the biochemistry of pathogenic anaerobes.—IV, The biochemistry of *Bacillus histolyticus*, C. G. L. WOLF and J. E. G. HARRIS (*Jour.*

Path. and Bact., 22 (1918), No. 1, pp. 1-21, fig. 1; *abs. in Chem. Abs.*, 12 (1918), No. 21, pp. 2206, 2207).—Continuing investigations previously noted (E. S. R., 38, p. 504), a study of the growth of *B. histolyticus* on various media is reported. Milk, peptone water, alkaline egg medium, and cooked meat medium were employed.

The amount and composition of the gas formed were found to vary with the medium. Peptone water and alkaline egg media were not vigorously attacked. The most vigorous catabolism and greatest gas production took place in the cooked medium. Amino acids and a large amount of ammonia were formed, together with large quantities of volatile acids, chiefly butyric and acetic. The extremely destructive effect of the organism on tissue is considered to be due to its remarkable proteolytic action.

The growth of bacteria in protein-free enzym and acid-digestion products, H. C. ROBINSON and L. F. RETTGER (*Jour. Bact.*, 3 (1918), No. 3, pp. 209-229; *abs. in Chem. Abs.*, 12 (1918), No. 21, pp. 2207, 2208).—Cultural tests with pathogenic and nonpathogenic organisms in protein-free media, such as opsine¹ and acid-digestion products of proteins, are reported.

The best results were obtained with opsine, in which practically all pathogenic and nonpathogenic organisms grew as well as or better than in Witte's peptone. A reaction slightly alkaline to litmus was found to be the best for general use. Glycerol increased the growths in alkaline but not in acid media, while glucose seemed to be somewhat detrimental. Meat extract and meat infusion were favorable to the action. The decomposition products of casein, lactalbumin, and edestin gave results inferior to opsine, hydrolyzed casein giving the best and edestin the poorest results.

The authors conclude that "bacteria do not require proteins, even in minute quantities, to carry on their normal cultural development, but obtain their sustenance from less complex substances, as for example the amino acids and perhaps some of the simpler polypeptides."

The optimum hydrogen ion concentration for the growth of pneumococcus, K. G. DERNBY and O. T. AVERY (*Jour. Expt. Med.*, 28 (1918), No. 3, pp. 345-357, figs. 2).—The optimum and limiting hydrogen ion concentrations for the growth of different types of pneumococcus have been determined, using Clark and Lubs's modification (E. S. R., 37, p. 506) of Sørensen's method for determining the hydrogen ion concentrations of the cultures and the Kober nephelometric method (E. S. R., 30, p. 410) of estimating the turbidity of broth suspension for determining the relative bacterial growth. The reported results are as follows:

"The optimum hydrogen ion concentration for the growth of the various types of pneumococcus is a pH of about 7.8. The limiting hydrogen ion concentrations for the growth of pneumococcus are a pH of 7 and a pH of 8.3. Phosphates used in adjusting reactions of media retard growth if present in a concentration greater than 0.1 molecular. Culture media for pneumococci should, therefore, have an initial reaction between a pH of 7.8 and 8 and a total salt concentration not exceeding 0.1 M."

The thermal death point and limiting hydrogen ion concentration of pathogenic streptococci, S. H. AYERS, W. T. JOHNSON, JR., and B. J. DAVIS (*Jour. Infect. Diseases*, 23 (1918), No. 3, pp. 290-300, figs. 2).—Further investigations on the thermal death point of pathogenic streptococci (E. S. R., 31, p. 574) are reported, from which the authors conclude that pathogenic streptococci are destroyed by the proper pasteurization of milk at 60° C. (140° F.) for a period of 30 minutes. A few cultures isolated from pathologic sources have thermal death points above 60°, showing that they would, therefore, survive pasteuriza-

¹ Presse Méd. [Paris], No. 21 (1913), p. 419.

tion. From their cultural characteristics these were believed to be nonpathogenic strains.

It was found that in a dextrose-yeast-peptone medium, pathogenic streptococci reached a limiting hydrogen ion concentration of from 5.4 to 6, while a nonpathogenic strain reached a concentration of from pH 4.5 to 4.9. It is thought that this difference in limiting hydrogen ion concentration, together with other characteristics such as hemolytic power and the fermentation of carbohydrates and other substances, may serve as an important differential characteristic between pathogenic and nonpathogenic streptococci. The value of the determination of hydrogen ion concentration in the study of fermentation is emphasized.

Further study on the cultural conditions of *Leptospira* (*Spirochæta*) *icterohæmorrhagiæ*, H. NOGUCHI (*Jour. Expt. Med.*, 27 (1918), No. 5, pp. 593-608).—The author finds that the presence of suitable animal or human serum is essential for the cultivation of *L. icterohæmorrhagiæ*, which is an obligatory aerobe.

The survival of *Leptospira* (*Spirochæta*) *icterohæmorrhagiæ* in nature; observations concerning microchemical reactions and intermediary hosts, H. NOGUCHI (*Jour. Expt. Med.*, 27 (1918), No. 5, pp. 609-625).—The larvæ and adults of the *Culex* mosquito, the larvæ of the house fly and bluebottle fly, wood ticks (*Dermacentor venustus* [andersoni]), and leeches failed to become carriers of the spirochetes when fed on infected guinea pigs or their organs; that is, they can not play the part of an intermediary host of *L. icterohæmorrhagiæ*.

Morphological characteristics and nomenclature of *Leptospira* (*Spirochæta*) *icterohæmorrhagiæ* (Inada and Ido), H. NOGUCHI (*Jour. Expt. Med.*, 27 (1918), No. 5, pp. 575-592, pls. 5, fig. 1).—"The present study deals with the morphology and systematic position of the causative agent of infectious jaundice. There are several features which are not found in any of the hitherto known genera of *Spirochætoidea* which led me to give this organism an independent generic name, *Leptospira*, denoting the peculiar minute elementary spirals running throughout the body. The absence of a definite terminal flagellum or any flagella and the remarkable flexibility of the terminal or caudal portion of the organism are other distinguishing features. Unlike all other so-called spirochetes the present organism resists the destructive action of 10 per cent saponin.

"A detailed comparative study of related genera, including *Spirochæta*, *Saprospira*, *Cristispira*, *Spiromema*, and *Treponema*, has been given with the view of bringing out more strongly the contrast between them and the new genus.

"A study has been made to discover whether any differential features exist among the strains of *L. icterohæmorrhagiæ* derived from the American, Japanese, and European sources, but none has been found. It is hoped that the creation of a new genus may facilitate a more exact morphological description than has hitherto been possible, due to the vague use of the term *Spirochæta* which indiscriminately covered at least six large genera of spiral organisms."

A streptothrix isolated from the blood of a patient bitten by a weasel (*Streptothrix putorii*), G. F. DICK and RUTH TUNNICLIFF (*Jour. Infect. Diseases*, 23 (1918), No. 2, pp. 183-187, fig. 1).—In the case here reported the clinical picture was similar to that of rat-bite fever, but the streptothrix (*S. putorii*) differs both morphologically and culturally from the organism associated with that disease (*S. muris-ratti*).

The evolution of views on gas infections, M. WEINBURG and P. SÉGUIN (*Bul. Inst. Pasteur*, 16 (1918), Nos. 1, pp. 1-8; 2, pp. 41-52).—In reviewing the prewar views of gas infections, it is pointed out that two species (?) alone were sup-

posed to cause such infections, namely, *Bacillus perfringens* and *B. œdematis maligni* (the "vibron septique" of Pasteur), and that they have always been considered separately.

The problem of acute infectious jaundice in the United States, M. H. NEILL (*Pub. Health Rpts. [U. S.], 33 (1918), No. 19, pp. 717-726*).—A summary of information on this disease, including brief reference to its prevalence among troops in Europe and the occurrence of *Spirochaeta icterohæmorrhagica* in wild rats in this country. A bibliography of 22 titles is included.

The causes of tuberculosis, L. COBBETT (*Cambridge, Eng.: University Press, 1917, pp. XVI+707, pls. 25, figs. 7*).—The several chapters of this work deal with the subject as follows: The tribute exacted by tuberculosis, the decline of tuberculosis, the extent to which each sex has shared in the decline of tuberculosis, the etiology of tuberculosis, portals of entry of tubercle bacilli (prenatal and post-natal infection), the relation between animal and human tuberculosis, the means of distinguishing the three types of tubercle bacilli one from another, the stability of type of tubercle bacilli in artificial culture, the stability of type of tubercle bacilli in the animal body, the susceptibility to tuberculosis of various animal species, tuberculosis in man—the types of tubercle bacilli which cause it, and the part played by bovine infection in human tuberculosis.

Tuberculin and mallein. Tuberculinization and malleinization, C. LÓPEZ and J. G. ARMENDARITZ (*Rev. Hig. y Sanidad Pecuarias [Spain], 8 (1918), No. 6-7, pp. 373-454*).—This is an historical survey of the subject. Part 1 consists of the history, evolution, and actual state of tuberculin and the present method of its preparation and use. In part 2 mallein and the various methods of malleinization are discussed in a similar manner.

Contagious abortion in cattle, A. THEILER (*Rhodesia Agr. Jour., 15 (1918), No. 3, pp. 268-278*).—This is a general discussion of the subject.

Mastitis of the cow, S. WALL, trans. by W. J. CROCKER (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. XI+166, figs. 29; rev. in Jour. Amer. Vet. Med. Assoc., 53 (1918), No. 4, pp. 558-560*).—This is a translation of the work previously noted (*E. S. R., 21, p. 283*). The subject is dealt with under the following headings: The udder of the cow, mastitis in general, mastitis caused by external force, infectious mastitis in general, types of infection, udder streptomycosis, udder staphylococcosis, udder colibacillosis, udder pyobacillosis, udder tuberculosis (pp. 87-105), udder actinomycosis, udder necrobacillosis, clinical diagnosis of mastitis, autopsy, importance of mastitis to milk control, the importance of mastitis to meat inspection, post-mortem report, and a few reports of contagious udder infections.

The review is by V. A. Moore.

Studies in bovine mastitis.—I, Nonhemolytic streptococci in inflammation of the udder, F. S. JONES (*Jour. Expt. Med., 28 (1918), No. 2, pp. 149-167*).—"It seems clearly established that nonhemolytic streptococci are responsible for a considerable number of cases of bovine mastitis. Of the 81 animals examined, 31 were suffering from infections of this type. The lesions produced in invaded quarters varied from an involvement of only the lining epithelium of the large milk ducts to severe degeneration and necrosis of the secreting epithelium. In one instance a considerable portion of the glandular elements had been replaced with connective tissue.

"The streptococci fall into two groups when their action on the various carbohydrates is considered. Thirty-four strains fermented dextrose, lactose, saccharose, maltose, and salicin; 5 others attacked the first four sugars but failed

to produce acid salicin. All mastitis streptococci failed to act upon raffinose, inulin, or mannite. One species isolated from a mammary abscess produced acid in all the carbohydrates.

"All the strains were agglutinated with an antiserum prepared from one typical strain. The agglutination titer varied over wide limits, although all the streptococci were agglutinated at a dilution of 1:500.

"None of the strains inoculated proved pathogenic for rabbits. A pig fed on the milk from two typical cases of mastitis remained well."

The treatment of English redwater by intravenous injection of tartar emetic, G. H. GIBBINGS and S. STOCKMAN (*Jour. Compar. Path. and Ther.*, 30 (1917), No. 4, pp. 316-320).—The authors report upon 84 cases treated by a single injection into the jugular vein of 16 grains of tartar emetic dissolved in 2 oz. of water, i. e., a 2 per cent solution. Of the 9 fatal cases 2 were treated with the drug on the first day symptoms were observed and the other 7 fatalities occurred among animals that did not receive the drug before the third day of illness. *Piroplasma divergens* is said to have been the parasite present in practically all the cases. It is pointed out that in cases of tropical piroplasmosis trypanblue is a specific, but in cases of English redwater due to *P. divergens* it does not seem to exert the same specific action.

Bracken poisoning in cattle in Great Britain, S. STOCKMAN (*Jour. Compar. Path. and Ther.*, 30 (1917), No. 4, pp. 311-316).—In feeding experiments with an 8-month-old bull calf 10 lbs. of *Pteris aquilina* shoots, cut and fed daily with other food for 29 days and entirely consumed for 26 days, caused death.

Claviceps paspali poisoning in cattle, R. PAINE (*Abs. in Vet. Rec.*, 30 (1917), No. 1525, p. 128).—A brief report on the poisoning of cattle by *C. paspali*, a form of ergot which occurs on *Paspalum dilatatum*, a grass widely grown in the Union of South Africa. Characteristic symptoms of ergot poisoning are produced.

The etiology and specific prophylaxis of exudative pleuropneumonia of the goat, N. MORI (*Nuovo Ercolani*, 21 (1916), April 30, pp. 196-198; May 10, pp. 205-211; May 20, pp. 221-228; *abs. in Rev. Hig. y Sanidad Vet.* [Spain], 6 (1916), No. 4, pp. 341-343; *Vet. Rec.*, 30 (1917), No. 1521, pp. 90, 91).—A report of studies of a disease of the goat in southern and central Italy which the author has identified with the boufrida of Algeria and with infectious pleuropneumonia of Germany.

Hog cholera: Symptoms, diagnosis, treatment, and prophylaxis, F. ROSENBUSCH, J. ZABALA, and R. GONZALEZ (*La Peste Porcina: Sintomas, Diagnóstico, Tratamiento y Profilaxis*. Buenos Aires: *Inst. Biol. Soc. Rural Argentina*, 1918, pp. 24, figs. 21).—This is a discussion of the symptoms, diagnosis, treatment, and prophylaxis of hog cholera. It contains several colored illustrations of lesions of various organs caused by the disease.

Contagious septicemia of the pig in Morocco, H. VELU (*Bul. Soc. Path. Exot.*, 11 (1918), No. 2, pp. 117-124; *abs. in Trop. Vet. Bul.*, 6 (1918), No. 2, pp. 126, 127).—A report of investigations of this disease, of which very serious and markedly contagious outbreaks occurred in several herds of pigs in the Chaouia region of Morocco in 1917.

Common parasites of swine, J. T. E. DINWOODIE (*S. Dak. Col. Agr. Ext. Circ.* 8 (1918), pp. 16, figs. 8).—A popular summary of information on the more important parasites of swine and means for their control.

Contagious abortion in mares and joint-ill in foals: Etiology and serum treatment, J. M. M'FADYEAN and J. T. EDWARDS (*Jour. Compar. Path. and Ther.*, 30 (1917), No. 4, pp. 321-366, figs. 2).—The authors' conclusions drawn from the investigations here reported, including 172 cases with symptoms of joint affec-

tion and 21 cases without distinct joint affection but with pervious urachus or suppurating navel, are as follows:

"The common cause of abortion in mares and of joint-ill in foals in Great Britain is the *Bacillus abortivo-equinus*. The treatment of cases of joint-ill and navel-ill by means of a serum obtained from horses hyperimmunized against this bacillus has yielded encouraging results."

Sclerostomes as a cause of debility, H. KIRK (*Vet. Jour.*, 74 (1918), No. 516, pp. 202-205).—The author presents evidence to show that sclerostomes are responsible for much of the debility among horses, the mortality from which during the war is said to have been colossal.

Strongylidæ in horses, W. YORKE and J. W. S. MACFIE (*Ann. Trop. Med. and Par.*, 12 (1918), No. 1, pp. 79-92, figs. 12).—In continuation of the paper previously noted (*E. S. R.*, 39, p. 686) the authors consider *Gyalocephalus capitatus*, which has been found by them in small numbers in 5 horses, and describe *G. equi*, found in small numbers in 3 horses, as new to science.

Poisoning of horses by corn-cockle (*Agrostemma githago*), BOISSIÈRE (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 22, pp. 465-467; *abs. in Vet. Rev.*, 2 (1918), No. 2, p. 201).—The author reports upon seven cases poisoned by feeding a ration including grain containing 20 per cent of corn-cockle seed. One animal died but showed no specific lesions on post-mortem examination. Treatment consisted of tapping the cecum and administration of tincture of opium.

Notes on the acanthocephalid and arthropod parasites of the dog in North America, M. C. HALL and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc.*, 53 (1918), No. 4, pp. 493-500, figs. 3).—The authors present notes on *Acanthocephala* and *Arthropoda* recorded as attacking the dog. *Echinorhynchus canis*, originally described from San Antonio, Tex., in 1909, is recorded as having been collected at College Station, indicating that it is established in Texas.

Studies on fowl cholera.—V, The toxins of *Bacillus avisepticus*, P. B. HADLEY (*Jour. Bact.*, 3 (1918), No. 3, pp. 277-291).—This is a continuation of studies previously reported from the Rhode Island Experiment Station (*E. S. R.*, 31, p. 781).

The present paper reports the results of an investigation in regard to discrepancies in results obtained by Bull¹ and by the author in regard to the toxicity of cultures of the fowl cholera bacterium. Agglutination and culture tests demonstrated that Bull's culture was a strain of the fowl typhoid bacterium and not a representative of the fowl cholera or hemorrhagic septicemia group. Cultures of the fowl cholera bacterium were again proved to be nontoxic and not opsonized into phagocytosis.

A contribution to the study of *Syngamus bronchialis*, W. FEUERREISSEN (*Abts. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 4, p. 607; *Clin. Vet. [Milan]*, *Rass. Pol. Sanit. e Ig.*, 40 (1917), No. 13, pp. 398, 399; *Vet. Rec.*, 30 (1917), No. 1522, p. 100).—A brief report of the occurrence of this parasite in a young goose from a flock of 25 which had fallen ill and many of which died with symptoms of asthma, loss of appetite, and debility. Seventy-two individual strongylids were found in the trachea of this goose.

RURAL ECONOMICS.

From the trenches to the furrows, E. BLANCHARD (*Des Tranchées aux Sillons. Saint-Étienne, France: Libr. Chevalier, 1917, pp. 157*).—This book deals with the question of intensifying agricultural production and increasing the financial resources of France after the war. The author recommends compulsory agricultural education, rural solidarity expressed by cooperative societies, a reor-

¹ *Jour. Expt. Med.*, 24 (1916), No. 1, pp. 25-33.

ganization of the French Department of Agriculture on the basis of decentralization, the Taylor system applied to agriculture as well as to industry, and special arrangements for irrigation, especially between the Loire and the Rhone. He also recommends a closer study of losses through climatic, meteorological, physiological, and parasitic causes.

Ways of making southern mountain farms more productive, J. H. ARNOLD (*U. S. Dept. Agr., Farmers' Bul. 905 (1918), pp. 28, figs. 10*).—The region studied in the southern Alleghenies, is comparatively thickly populated with people who make their main living by farming. The farms range in size from 40 to 200 acres, usually with a small area in cultivation and little pasture for live stock, and often produce no more than a scant living for the farmer. Corn is the chief crop grown. Usually part of the farm lies idle, being "rested," while corn is grown on another part year after year until the land is worn out.

The publication shows the distribution of the land on several farms representing typical sections of the region. The following figures are given as typical of small mountain farms in the more thickly populated districts of eastern Kentucky: Woods 48 acres, idle land "resting" or partly in pasture 20, corn 12, hay or other forage 2, oats 1, house and barn one-half, garden one-half, and sorghum, potatoes, beans, and orchard one-fourth acre each.

In a few localities there have developed markets for special farm products, such as vegetables and small fruits, cured meats, poultry, and dairy products, especially cheese. Suggestions for better management include improving the cropping system, increasing the live stock, and the use of manure and lime. Directions are given for burning lime where limestone is available. The author gives complete directions for starting a crop rotation and for replanning the cropping system on a typical farm and making provisions for pasture for hogs. He also gives suggestions for improving the management of a small grazing farm.

A study of farming in southwestern Kentucky, J. H. ARNOLD (*U. S. Dept. Agr. Bul. 713 (1918), pp. 19*).—The author found the average labor income of the 342 farms studied to be \$356.55, and the average land earnings \$3.14 per acre, net. The average for the 140 most successful farms was \$6.14 per acre.

By the analysis of returns from live stock it was shown that farms having the equivalent of one cow or horse to seven or eight acres of land were almost invariably the more profitable, and crop yields increased with the increased amount of live stock kept on a given area of land. The average of the farms showed \$107.57 in net receipts made for each \$100 worth of products fed, valuing the latter at farm prices and including the farmer's estimate of the charge for pasture. The average of the best 39 farms showed \$226 net receipts for each \$100 worth of feed, while the average of 46 farms showing greatest loss was \$33 loss for each \$100 worth of feed.

The wheat crop was more important on the larger farms. A tendency to make dairying an important enterprise was shown on farms of 200 to 300 acres in size, yet the strictly dairy type of farm is not generally recommended. About 12 per cent of the crop area on the average small farm and 6 to 8 per cent on the large farms is given to tobacco. The most important crops in this section are winter wheat, dark tobacco, corn, timothy, and red clover, with the more recent additions of cowpeas, soy beans, and lespedeza.

A study of five individual farms, the smallest consisting of 89 acres and the largest of 1,091 acres, is included as illustrating good standards for the organization of farms in the area studied.

A five-year farm management survey in Palmer Township, Washington County, Ohio, 1912-1916, H. H. HAWTHORNE (*U. S. Dept. Agr. Bul. 716 (1918), pp. 53, pls. 2, figs. 13*).—This bulletin presents a study of a farm management

survey of 73 southeastern Ohio hill farms, on 25 of which the survey was conducted for five successive years, 1912 to 1916, inclusive.

For five years the average annual sales on 25 farms were \$925 per farm, operating expenses requiring 45 per cent of this amount. The farms averaged 156 acres, worth \$30 per acre. With the value of live stock, machinery, etc., the average farm investment was \$6,378. Allowing 5 per cent interest on the investment, the labor income averaged \$187, or, estimating the value of the farmer's labor at \$290, the return on the investment was 3.4 per cent.

One-half of the land was in pasture and one-fourth in corn, wheat, and hay. The crops were mostly fed to beef cattle, poultry, fine-wooled sheep, hogs, and work stock. Practically 75 per cent of the receipts was from the sales of live stock, including eggs, wool, and dairy products. Profits varied widely, the chief factors affecting the differences being the size and the quality of the business.

Some of the indicative changes taking place in the five years were an increase in live-stock investment and production, a gradual shifting from sheep to cattle, and larger sales of dairy products, especially of cream, accompanying an increase in corn acreage and the building of silos. Sheep decreased 58 per cent, the greater change taking place on farms that kept sheep primarily for wool production rather than on farms selling lambs and wool, and cattle increased 68 per cent. The sale of dairy products increased \$50 per farm. The five-year average crop yields were corn 44 bu. per acre, wheat 14 bu., and hay 1.2 tons per acre. Different crop yields were from 50 to 100 per cent better some years than others, but in no year were all crops good or all crops poor. Price levels increased 23 per cent and operating expenses 11 per cent in the five years.

The economic possibilities of the Province of Thai-nguyen and the conditions of its rise, A. DABLES (*Bul. Econ. Indo-Chine, n. ser., 20 (1917), No. 127, pp. 620-642, pl. 1*).—This report is a study of the eight districts which constitute the Province of Thai-nguyen in Indo-China. Three districts are thought to offer no future to indigenous agricultural colonization, but the central and southwest sections offer considerable possibilities of expansion. The author suggests a Government campaign to push emigration toward those regions, using as aids the schools, a bonus system for colonies of 50 families, and district managers for conducting the campaign, and assisting the colonists by providing buildings, implements, and seeds.

What a community can do to assist in securing a fruit or vegetable product plant, R. C. PAULUS (*Proc. Wash. State Hort. Assoc., 14 (1918), pp. 42-51*).—This article discusses practically all the factors which pertain to the establishing of fruit and vegetable canneries, evaporators, cider and vinegar plants, juice factories, and plants of a kindred nature. It is pointed out that investigation must be made as to the available raw products and their grade, freight rates, sources of power, water, and fuel, climatic conditions, labor, financing, sales markets competition, and possibilities for expansion. A full report of the discussion of these points follows the article.

The community market, L. P. JEFFERSON (*Mass. Agr. Col. Ext. Serv. Bul. 21 (1918), pp. 22, pls. 3*).—This bulletin explains in detail the benefits and limitations of a community market to the producer and to the consumer. It takes up the conditions necessary to establish, equip, and maintain a paying market, and discusses the plan as carried out in Massachusetts. Appendixes give the text of the Massachusetts laws authorizing the establishment of community markets and sample forms used in the various markets.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul.*, 5 (1918), No. 24, pp. 8).—This contains information by W. R. Camp for growers and shippers of agricultural products as to the markets for their goods at some one of the army camps in North and South Carolina. There is also the usual list of products which farmers have for sale.

Wholesale prices and receipts of apples in Boston for thirty-six years, F. E. ROGERS (*N. Y. State Col. Agr. Cornell Ext. Bul.* 28 (1918), pp. 149-159, fig. 1).—This is a study of the wholesale prices and receipts of apples in Boston for 36 years, based on data obtained from the Weekly Review of the Boston Produce Market Report, and including the prices of different varieties by months and years.

The last ten-year period shows a slight decrease in receipts over the previous period. More than half the apples are received during October and November, and receipts are heaviest in November and lightest in June. Most varieties show a decrease in price for the first three periods, but with a marked increase during the last ten years.

Geographical phases of farm prices: Corn, L. B. ZAPOLEON (*U. S. Dept. Agr. Bul.* 696 (1918), pp. 53, pls. 2, figs. 8).—The author points out that yields to the acre may be said to reflect limitations of climate and soil, but that the farm or producer's price is the result of commercial factors which vary with each item of farm production in a section. The author found that the lowest prices were paid to producers of corn in the corn belt from eastern Nebraska to western Ohio, the minimum being found in the northwestern corner of this section and the adjoining parts of Iowa, Minnesota, South Dakota, and Nebraska.

"Within the territory of low-corn prices are comprised the areas of greatest corn and live-stock production. They contribute almost the entire gross corn supply of the country and substantially all the corn entering trade channels. The minimum price obtains in the part of the corn belt which is most disadvantageously located with regard to important markets. All other sections produce less than their requirements and must supplement local crops by shipments from the surplus-producing country."

Prices rise irregularly in the direction of this distributive movement. The trade currents are influenced by the manifold uses of corn, conditions in foreign and domestic live stock and grain markets, and the flexible character of the demand as expressed by variations in annual corn consumption. The outstanding feature of the distributive movement of corn is the local character of its markets, only a fifth of the crop entering into national trade channels.

The text is illustrated by numerous maps, tables, and graphs.

Monthly Crop Report (*U. S. Dept. Agr., Mo. Crop Rpt.*, 4 (1918), No. 9, pp. 101-116 figs. 6).—This contains the usual data concerning estimated crop conditions September 1, 1918, with comparisons; estimated farm value of important products August 15; average prices received by producers; and range of prices of agricultural products at the principal markets. The following special articles are also included: Cotton conditions; labor supply for harvesting the cotton crop; monthly marketings of wheat, corn, flax, and oats by farmers; average farm price of the 1917 wheat crop by States; Florida citrus crop; Louisiana sugar report; acreage of tomatoes contracted for by canneries; monthly hog market receipts; percentage of leading varieties of rice compared to the total acreage planted, by States; exports of durum wheat; Philippine Islands sugar production; critical months of the crop growing season (see p. 810); live stock on farms; number of stock hogs September 1, 1918 and 1917; wool production by States; honey bees; farm prices and retail prices compared; and commercial stocks of farm products.

Report of the bureau of statistics, L. H. WIBLE (*Ann. Rpt. Penn. Dept. Agr.*, 22 (1916), pp. 173-231).—This consists of detailed monthly reports, by counties, together with comments on the conditions of crops, live stock, and weather for the year ended December 31, 1916. It includes, also, statistics concerning prices of crops, farm labor (male and female), number of farmers using automobiles for business and pleasure, number of farmers using cream separators, number of sheep killed, number of lambs compared with average years, number of fleeces clipped compared with the previous year, and a list of county and local agricultural societies.

Annual statistics of Uruguay (*An. Estad. Uruguay*, 25 (1915), pp. XIV+655).—In this report are shown the statistics of cereal, tobacco, and other crops from 1898-99 to 1914-15; a classification of the area devoted to agricultural purposes; the number of harvesting machines and motors; Government distribution of seeds; credits for increased production; and animals inspected for export and import.

[Agriculture in Norway] (*Statist. Aarbok Konger. Norge*, 36 (1916), pp. 24-36; 37 (1917), pp. 25-37).—These pages continue data previously noted (E. S. R., 33, p. 295) by adding statistics for the years 1916 and 1917.

Agricultural statistics of British India, 1914-15, 1915-16, G. F. SHIRRAS (*Agr. Statis. India*, 31 (1914-15), I, pp. X+413, pls. 5; 32 (1915-16), I, pp. X+317, pls. 4).—These reports continue the information previously noted (E. S. R., 36, p. 291) by adding data for the years 1914-15 and 1915-16.

Agriculture of German Southwest Africa, J. GAD (*Abhandl. Hamburg. Kolon. Inst.*, 28 (1915), pp. VIII+146, pl. 1).—This report consists chiefly of tables of statistics, with explanations dealing with matters of soil, irrigation, climate, live stock, distribution and management of agricultural land, farm labor, capital, and credit for farmers.

AGRICULTURAL EDUCATION.

Proceedings of the thirty-first annual convention of the Association of American Agricultural Colleges and Experiment Stations, 1917, edited by J. L. HILLS (*Proc. Assoc. Amer. Agr. Colls. and Expt. Stas.*, 31 (1917), pp. 328).—These proceedings have been previously noted (E. S. R., 37, p. 601), with the exception of several papers dealing with general engineering questions and the following: Agricultural Engineering at Land-grant Colleges, by A. M. Soule (pp. 247-252) and E. S. Keene (pp. 252-255); The War Program Suggested by the U. S. Department of Agriculture for 1918 Pork Production, by G. M. Rommel (pp. 286-293); The Relationship of Agricultural Extension Work to Farmers' Cooperative Buying and Selling Organizations, by B. Knapp (pp. 305-308); and The Moving Picture As a Means of Distributing Agricultural Information, by E. C. Johnson (pp. 311-315).

The agricultural institute and its instruction, 1876-1917 (*Ann. Inst. Nat. Agron.*, 2. ser., vol. 2, No. 1, 2. ed. (1917), pp. 547, pl. 1, figs. 140).—This volume is a second edition of the memoir of 1876-1901, previously noted (E. S. R., 14, p. 832), with the addition of changes up to 1917.

Progress in agricultural education, J. MACKENNA (*Rpt. Prog. Agr. India*, 1916-17, pp. 121-129).—This report is concerned mainly with resolutions passed by a conference held at Simla in June, 1917, to consider the question of agricultural education in India.

With regard to the agricultural colleges the view generally held was "that they should aim at giving a liberal and scientific education, which should be as complete as possible and not be restricted to the training of men for sub-

ordinate departmental requirements." It was decided that local governments should be left to work out their collegiate courses with reference to their local conditions, and that each of the principal Provinces should have its own agricultural college as soon as its agricultural development justifies that step. The work of the agricultural colleges for the year is briefly reviewed.

In addition to the collegiate courses, short courses in agriculture are given in vernacular in some Provinces for the sons of Zamindars and small land owners. In some cases men so trained are admitted to the subordinate service of the agricultural department. In the Punjab a six months' vernacular course is given at Lyallpur, and in the United Provinces the two-year vernacular course is attached to the Cawnpore College.

With reference to the question of giving a rural tinge to the education of the sons of farmers in primary schools, the conference expressed the opinion that the textbooks and instruction should be adapted more closely to rural needs. It was agreed that no attempt should be made in primary schools to teach agriculture or horticulture but that nature study should form a necessary part of the curriculum in rural schools, that all subjects should be taught in relation to rural life, that a garden should be attached to each rural school, and that teachers of rural schools should be recruited as far as possible from the rural population. It is noted that in Mysore a beginning has been made in the organization of rural science classes in four selected village schools.

The conference was of the opinion that every rural district should have one or more agricultural middle schools, usually situated near demonstration or experimental farms. Four such schools are successfully working in the Bombay Presidency. In Travancore two night schools were opened during the year for the purpose of giving agricultural instruction to the sons of cultivators. The schools were attended by 36 boys. Theoretical instruction was given in the evenings between six and eight, while practical work in the field was done in the mornings and on days when the pupils had leisure.

Principles and policies in home economics education, HENRIETTA W. CALVIN (*U. S. Bur. Ed., Home Econ. Cir. 4* (1918), pp. 12).—In this circular are discussed the scope and aims in home economics instruction, the content of home economics courses and their adaptation to special needs, details of courses in grades 5 to 9, inclusive and in continuation courses, supervision and instruction in home economics, laboratories and equipment, etc.

Brief history of the Massachusetts Agricultural College, L. B. CASWELL (*Amherst: Mass. Agr. Col.* [1917], pp. [4]+72, pls. 8).—This comprises volume 1 of the semi-centennial publications issued in commemoration of the completion of the first 50 years of instruction at the Massachusetts Agricultural College, 1867-1917. Accounts are given of the evolution of the college, the opening of the college, the administration of President Clark, the college from 1879-1886, the administrations of Presidents Goodell and Butterfield, the experiment stations, and the extension work. An appendix deals with additions to the college real estate.

Serving Wisconsin farmers in war time, H. L. RUSSELL and K. L. HATCH (*Wisconsin Sta. Bul.* 294 (1918), pp. 32, figs. 19).—This is the annual report of the director of the agricultural extension service. Special emphasis is given to the work of the 54 county agents and emergency food agents in special production and food conservation campaigns.

Dominion aid to agricultural instruction in Canada (*Ottawa, Canada: Dept. Agr.*, 1917, pp. 36).—This is a review of the work performed by the various Provinces with the funds, amounting to a total of \$3,400,000, granted under the Agricultural Instruction Act during the four-year period 1913-1917.

Report of the inspector of elementary agricultural classes, J. B. DANDENO (*Rpt. Min. Ed. Ontario, 1917, pp. 63-90*).—The inspector of elementary agricultural classes in Ontario reports that the number of schools qualifying for grants for agricultural instruction has increased from 33 in 1903 to about 950 in 1917, the number of school gardens from 203 in 1914 to 550 in 1917, and the number of home gardens from 56 to 400 in the same period. The Dominion Government appropriated \$30,000 per annum to be paid out on the recommendation of the department of education for the teaching of agriculture and domestic science in high, public, separate, and continuation schools, and in universities. The regulations for these grants have been amended recently to include schools in cities and towns qualifying for the work. The school-fair movement has grown year by year since its inception in 1909, until in 1917 there were no less than 302 school fairs in the Province.

The 1917 campaign for greater food production, including the school gardens, home gardens, and the poultry project, is estimated to have produced a total increase of foods valued at \$55,500.

The chief difficulty in introducing and maintaining classes in agriculture in the secondary schools was found to be a lack of legally qualified teachers. Until agriculture is recognized as a cultural subject of some importance, leading to a course in a university, it will be seriously handicapped in the high school. Considerable progress was noted in agricultural instruction in normal schools, but the author states that first-class work can not be expected until greenhouses have been provided and the students have had in the high schools a course of practical work. Courses in agriculture for teachers in primary or secondary schools are provided by the Ontario Agricultural College, covering two consecutive summers of five weeks each, on the completion of which a certificate is awarded. A four weeks' course in farm mechanics open to teachers holding intermediate certificates in agriculture was also given.

Report of the Department of Agriculture [of Finland] for 1915 (*Landtbr. Styr. Meddel. [Finland], No. 115 (1915), pp. [4]+152*).—This is the usual review of the activities of the department through its education and research institutions, societies, and experts, for the advancement of Finnish agriculture.

List of agricultural and horticultural officials, institutions, and organizations (*Dept. Landb., Nijr. en Handel [Netherlands], Verslag. en Meded. Dir. Landb., No. 2 (1918), pp. 143*).—This is the annual official organization list of the Direction of Agriculture of the Department of Agriculture, Industry, and Commerce, including higher and secondary agricultural education and research institutions, agricultural and horticultural winter schools and courses, itinerant instructors, and associations in the Netherlands in 1918.

Western agriculture, J. A. WIDTSOE and G. STEWART (*St. Paul, Minn.: Webb Publishing Co., 1918, pp. 464, pl. 1, figs. 197*).—This text, each chapter of which has been written by a specialist, deals with the following topics: How crops grow; the soil; dry farming; irrigation; farm machinery; crops; plant enemies; animal production; agricultural manufactures, including sugar, flour, and milk and its products; farm buildings; and miscellaneous subjects, including the improvement of plants and animals, light and water supply, good roads and the telephone, the farm community, marketing farm products, and the farm home. The subject matter for classroom instruction is supplemented with directions for practical exercises and projects, and references to helpful literature.

Illustrated lecture on green manuring, A. J. PIETERS (*U. S. Dept. Agr., States Relat. Serv. Syllabus 34 (1918), pp. 24*).—This syllabus, which has been prepared by cooperation between the Bureau of Plant Industry and this Service, is designed to aid farmers' institute and other extension lecturers in presenting this

subject before popular audiences. It defines the term "green manure" and discusses the physical and chemical effects of green manures; the processes of increasing the amount of available nitrogen in the soil through nodule-forming bacteria, nitrification, and nitrogen-fixing organisms; green manure *v.* stable manure; and green manure crops as regards their effect on the yield of a subsequent crop, residual value, economy of turning under, moisture, and regional distribution of various crops. A list of 50 lantern slides to illustrate the lecture is appended.

The vegetable garden, E. J. S. LAY (*London: Macmillan & Co., Ltd., 1917, pp. 144, figs. 58*).—This textbook is one of the Pupils' Class-book Series, and is written for young pupils in simple language to help them to understand the reasons for the common garden processes in relation to the soil and climate, the cause, conditions, and remedies for many plant diseases, and some well-known and generally practiced methods of sowing and planting the chief crops of the vegetable garden. Each chapter begins with a number of simple experiments and closes with a summary for ready reference and a list of exercises. A garden calendar and short glossary are included in the final chapter.

Food: Its composition and preparation, MARY T. DOWD and JEAN D. JAMESON (*New York: John Wiley & Sons, Inc., 1918, pp. VIII+173, pl. 1, figs. 42*).—This text, which is an elaboration of the notes dictated by the authors to their own high-school classes, is designed to supplement the laboratory work and to bring to the pupils a clearer conception of the relation between the cost of foods and their nutritive value. It consists of a study of the classification, composition and food value, selection and care, preparation and cooking, digestibility, functions in the body, etc., of foodstuffs, proceeding from a consideration of the simple compound water to the more complex compounds. Chapters on food requirements of the body, food combinations in meals, and the preservation of foods, and a glossary are included, and experiments and suggestions for laboratory practice are interspersed throughout the book.

MISCELLANEOUS.

Monthly Bulletin of the Ohio Experiment Station (Mo. Bul. Ohio Sta., 3 (1918), No. 9, pp. 259-287, figs. 9).—This contains several articles abstracted elsewhere in this issue, together with the following: Various Amounts of Protein in Rations for Laying Hens, by W. J. Buss, a summary of Bulletins 291 and 322 (*E. S. R.*, 35, p. 171; 39, p. 275); Transplant Peonies in September, by W. E. Bontrager; More Varieties of Cultivated Plants Needed, by W. J. Green; Treating Seed Wheat to Prevent Smut, Scab, Etc.; and notes.

Monthly bulletin of the Western Washington Substation (Washington Sta. West. Wash. Sta. Mo. Bul., 6 (1918), No. 6, pp. 77-87, figs. 4).—This contains brief articles on the following subjects: Important Factors in Milk Production, by W. A. Linklater; Cranberries in Western Washington and Save Seed Potatoes Now, both by J. H. Stahl; Why Potatoes Rot and How to Prevent Rotting and Black Spot Canker or Apple Anthracnose, both by A. Frank; Are You a Successful Poultryman? by Mrs. G. R. Shoup; Fall Manuring, by E. B. Stookey; and Comparative Yields of Spring and Fall Cereals, by E. B. Stookey (see p. 836).

Publications of the experiment station available for distribution (Indiana Sta. Circ. 83 (1918), pp. 16, figs. 17).—A classified list of the available publications of the Indiana Station.

NOTES.

Mississippi College and Station.—E. R. Lloyd, for many years in charge of the agricultural work in the institution, resigned January 1, 1919, to engage in farm development work at Memphis, Tenn. J. R. Ricks, agronomist and vice-director, has been appointed director of the station.

Oregon Station.—J. S. Jones, formerly director of the Idaho Station, has been appointed chief in agricultural chemistry.

Necrology.—The renewed receipt of scientific literature from Germany brings news of the death of Geheimrat Bernhard Tollens, of the University of Göttingen. He died January 31, 1918, after long and severe illness, in his seventy-seventh year. A graduate of Göttingen, Dr. Tollens spent several years as assistant in chemistry at Heidelberg and in Paris, going for a year to Portugal, but returned to Göttingen in 1879 as assistant to the famous chemist Wöhler. Three years later he became director of the Agricultural Chemical Laboratory of the Agricultural Institute, occupying that position up to the time of his retirement in 1911.

Professor Tollens was known throughout the scientific world as one of the leading specialists in carbohydrates and an authority on the pentose group. He was a remarkably industrious worker and his contributions ran into large numbers. In 1888 he published his *Handbuch der Kohlenhydrate* which was a compendium of existing knowledge upon the carbohydrates. This was twice revised, the third edition appearing in 1914, an exhaustive treatise of more than 800 pages and a monument not only to his knowledge of the subject but to his industry and painstaking care as a compiler. He was long a regular contributor to the *Journal für Landwirtschaft*, and on the death of Liebscher in 1896 he became its editor, continuing to serve in that capacity until his final illness.

Professor Tollens was widely known in this country on account of the large number of American students who had received their university training at his hands. These found in him not only a proficient teacher and resourceful investigator, but a kind, patient, and sympathetic friend, whom they honored in life and will revere in memory.

The first issue of *Die landwirtschaftlichen Versuchs-Stationen* received for several years reports the death of Prof. Theodore Dietrich, familiar to students of animal nutrition through his compilation on the composition and digestibility of feeding stuffs, made in association with Prof. J. König. The first edition of this work appeared in 1874 and the second revised edition in 1891.

Professor Dietrich was director of one of the earliest German experiment stations, established at Haidau in the district of Cassell in 1857, and removed to Marburg in 1880. His earlier work related to the weathering of rocks, soil studies, etc., and was later extended to plant chemistry and to the digestion of feeding stuffs. He retired in 1902 but continued to be associated with the *Jahresbericht . . . der Agrikulturchemie*, of which he was joint author with Hilger from 1867 to the latter's death in 1904 and following this was sole author for 10 years. He died October 1, 1917, in his eighty-fifth year.



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